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GENERAL INFORMATION

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ALBERTA SURVIVAL PLAN

VOLUME TWO

GENERAL INFORMATION

ALBERTA EMERGENCY MEASURES ORGANIZATION

FEBRUARY 1961

Arnold J. Lavoie
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Minister

ALBERTA SURVIVAL PLAN

VOLUME TWO

GENERAL INFORMATION

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CONTENTS

Page

General 1

Some Questions and Answers about
Nuclear War and Related Subjects .... 1 - 9

List of Annexes 9

Distribution 9

PROVINCE OF ALBERTA

ALBERTA SURVIVAL PLAN

VOLUME TWO

GENERAL INFORMATION

GENERAL

1. The Alberta Survival Plan is divided into a number of volumes commencing with VOLUME ONE - PLANNING INSTRUCTIONS, and followed by VOLUME TWO - GENERAL INFORMATION. These two volumes are applicable to the production of plans for Departments of Government, Municipalities and Agencies involved. All volumes will be issued in loose leaf form and will be published complete or in part as required.

2. The general information contained in this volume is provided as guidance material for planning officers who have been assigned the responsibility of preparing detailed plans for their government department, municipal authority or other agency.

3. Attached annexes will be amended as required, and as additional information is prepared for issue, further Annexes will be published.

4. Planning Officers are urged to ensure amendments are made and additions added at the time of their issue so that plans, whether in the process of preparation or completed, may be kept up to date in the light of knowledge available.

5. There are many questions which arise concerning survival in a nuclear war that cannot be answered without considerable research into the problem. The Federal Emergency Measures Organization has compiled some of the more common questions which have arisen and have given their answers to these questions. These are reproduced verbatim and should be helpful to planners.

6. DOES NUCLEAR WAR MEAN MUTUAL ANNIHILATION AS SOME SCIENTISTS SAY?

Unfortunately, many people today pass for scientists and, as a result

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of the public's image of a scientist being a rational, unbiased individual, people tend to give credence to a great many half truths, innuendoes, etc., made by people who claim to be scientists. A scientist is a person who has attained special capabilities in some specialized branch of Science. When he speaks on fields outside of his own, he no longer speaks with the authority of a scientist. Many of those who make loose statements concerning nuclear war or the effects of radiation on human populations, have no technical competence in those fields to speak with authority. Much of what they say can be challenged by authoritative sources on the subject such as "The Hazards to Man of Nuclear and Allied Radiations", produced by the British Medical Research Council; the Government of India's publication entitled "Nuclear Explosions and Their Effects"; and the report of the United Nations Scientific Committee on the Effects of Atomic Radiation.

7. WILL A NUCLEAR EXPLOSION KILL EVERYTHING WITHIN A SPECIFIED RANGE?

Nuclear weapons, like any explosive device, are limited in what they can do. Unless someone specifies a specific yield of a weapon, no one can predict exactly what will happen. In discussing nuclear weapons and their effects, generalities are frequently false. For example, in the case of a five megaton weapon, the range of extreme blast damage is in the order of fifteen miles, but this does not mean that everybody within that range will be killed. In fact, with relatively simple precautions such as sufficient warning to enable the population of an area to get into ordinary basements, a large number of people would survive these blast effects who would otherwise be killed. However, if one does survive the immediate effects of blast, he still must be prepared to contend with the effects of radiation fallout, but the means of protection against this hazard are surprisingly simple.

8. DO QUOTATIONS OF UNQUALIFIED CASUALTY FIGURES PROVE ANYTHING?

When dealing with estimates of casualties which are made by civil

defence planners, one should realize that the starting point of these estimates is to assign to the enemy every possible advantage in his attack delivery, to permit the maximum explosive effects to take place, to put the civil population in the worst state of preparation. In laying down such assumptions, some pretty grim casualty totals can be developed. However, this is the planner's starting point, from which programs can be designed to alleviate these results. Unfortunately, the ill-informed take these estimates without knowing the conditions under which they were formulated, and then go on to show that preparations would be next to useless when, in fact, preparations of various types will decrease the numbers of casualties considerably.

9. WERE 400,000 PEOPLE KILLED BY THE ATOMIC BOMBING OF HIROSHIMA?

The total casualties, as reported in the Government of India's publication "Nuclear Explosions and Their Effects", for the atomic bombings on both Hiroshima and Nagasaki, and the conventional bombing attack on Tokyo in March, 1945, are reproduced in the table below:

	Hiroshima: Atomic Bomb	Nagasaki: Atomic Bomb	Tokyo Raid: 1,667 tons TNT and Incendiary
Dead	78,150	23,753	83,000
Missing	13,983	1,924	
Injured	37,424	23,345	102,000
Otherwise Afflicted	235,656	89,025	
Total	365,213	138,047	
Population per Sq.Mile	35,000	65,000	130,000
Sq.Miles destroyed	4.7	1.8	15.8

10.. The figures for the casualties in Hiroshima and Nagasaki are taken from the publication "Atomic Bomb Injuries" edited by the Japanese Preparatory Committee for Le Congrès Mondial des Médicins pour l'Étude

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des Conditions Actuelles de Vie (Chief Editor: N. Kusano), Tokyo (1953). The figures of population and area destroyed, and also all the figures in the last column are taken from the USAEC publication, "The Effects of Atomic Weapons (1950)".

11. WILL ALL THE PEOPLE OF NORTH AMERICA BE KILLED IN A NUCLEAR WAR?

Theoretically, it is possible to kill everyone, but as a practical endeavour it is an impossibility. The practical capability of an enemy is limited by the number of weapons he has, the number of carriers he has to deliver them, the effectiveness of each weapon delivered and the reaction of the people attacked to the situation. There is not one single effect of a nuclear detonation which cannot be counteracted to a degree by some form of defence. Not all of these will be successful, but their individual contributions ensure that large numbers will survive. Protection can be afforded against all the immediate effects such as blast, heat and immediate radioactivity and fallout. The long-term problem of radiation fallout can be lessened by adequate control measures such as decontamination, eating uncontaminated foods, and so on. Additionally, the intensity of radiation fallout decays rapidly with the passage of time so that it becomes steadily less dangerous as time passes.

12. IF CANADA IS ATTACKED BY NUCLEAR WEAPONS WOULD MILLIONS OF PEOPLE BE KILLED?

No one can predict with accuracy the total numbers of people who could be killed or injured. However, if a five megaton bomb was detonated over each of the thirteen major cities in Canada in daytime, with no warning and with no civil preparations, more than 3,000,000 people could be killed by the immediate effects of the explosions; but given any reasonable amount of warning, and with such preparations as are being recommended by the government, in effect these numbers could be reduced very greatly. The toll of human life under any circumstances would be great, but it is not necessarily true that all would die. Much has been made of the casualties which resulted from the

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atomic explosions in Hiroshima and Nagasaki, to try to make a case for the futility of emergency planning. A study of the effects of those catastrophes indicates that of the total who died, 30 per cent of the deaths probably occurred instantaneously, another 30 per cent died within the next day, and the remainder in a period of up to two months. The point of hope is that to all intents and purposes there was no warning of attack, the population was totally unprepared, and there were no adequate medical and rescue facilities available. We do recognize the scope of the present threat, but there is much that can be done to blunt it.

13. IS IT TRUE THAT THE AMOUNT OF DEVASTATION WHICH WOULD BE WROUGHT WOULD MAKE IT USELESS TO WANT TO LIVE AFTER ATTACK?

It is true that the devastation which would be caused by nuclear detonations would be great. However, the physical effects of the explosion are limited to the immediate area of the explosion. Cities such as Hiroshima, Nagasaki and Hamburg were destroyed but they have been rebuilt. Additionally, there would be extensive areas in the country which would be unaffected by the attack and which will ensure a capability of surviving under reasonable conditions.

14. WHY THE PRESENT HOUSEHOLD FALLOUT SHELTER PROGRAMME?

As a result of government studies by scientists of the Defence Research Board and others, it has been determined that in the event of nuclear war, the hazard to the major part of the Canadian population would arise from the radiation fallout created by nuclear detonations on Canada or in the United States. Accordingly, it was felt that the first step in an effective shelter programme should be devoted to the protection which could be afforded against radiation fallout.

15. It is a scientific fact that the harmful effects of radiation to humans can be reduced by dense materials such as lead, earth and cement. It is on the basis of this fact that radiologists can daily work in the area of

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harmful X-rays and receive protection from the effects of this form of radiation. It is this principle which is inherent within the design of the present government-sponsored fallout shelter. In making its recommendations to the Canadian public, the government was not only thinking of keeping people alive through the period of nuclear assault, but it was also thinking of the long-term hazards of residual fallout which might be present for months or even years after a nuclear war. The present fallout shelter is intended to reduce the immediate accumulated dose of radioactivity during the early period of nuclear war, to levels which will ensure that those who had been occupants of such shelters will not be seriously affected by the long-term effects of this radiation fallout. On the other hand, a person who had not received the initial protection provided by a fallout shelter and had accumulated a sizeable immediate dose of radioactivity might be seriously affected by the long-term effects.

16. WILL PEOPLE IN FACT STAY IN THEIR SHELTERS FOR FOURTEEN DAYS?

There is a popular misconception in the minds of many people that in the event of nuclear war, everybody would have to stay in their shelters for fourteen days. This is not so. On the basis of studies and actual nuclear tests, it has been ascertained that in any pattern of radiation fallout, there will be some areas which will receive a very heavy concentration of fallout while others will receive varying degrees of contamination. Unfortunately, no one can predict where these areas will be until after actual nuclear detonations take place. A small percentage of people who happen to be located in areas of heavy contamination will be advised to stay in their shelters for fourteen days, but the great majority of the people will not have to stay in their fallout shelters continuously for longer than a few days.

17. In any case, although it would be a hardship to be confined in such a small place for fourteen days, it can be done. It has been done and no doubt, in a case of life or death, people will choose to stay

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protected in this way for whatever time is required, even up to fourteen days.

18. WHEN WILL PEOPLE BE TOLD TO LEAVE SHELTERS?

An emergency broadcasting plan is presently being developed to ensure that radio broadcasting instructions from provincial authorities can be given during a period of national emergency. The population is being advised that they should take into their shelters a battery-operated radio by which they will be able to hear instructions for the full period of time they are likely to have to remain under cover. Those who do not choose to have a battery-operated radio are advised to stay under cover until instructed to come out. This is another reason why a fourteen day supply of food is recommended.

19. WILL THE LONG-TERM EFFECTS OF RADIATION CAUSE SERIOUS MALFORMATIONS TO FUTURE GENERATIONS?

Strontium 90, a by-product of nuclear explosions, has been designated as the main villain, but Strontium 90 does not cause genetic changes. Large doses have caused bone tumors in animals, but it is impossible to state how much a human would have to take in to cause bone tumor. No one -- not even the most reliable scientist -- will state categorically the amount one must absorb to cause cancer. Additionally, there is sufficient evidence available to indicate that the intake of Strontium 90 by a human can be reduced by health control measures. This is not to deny its dangerous potential which, if uncontrolled, could conceivably cause large numbers of cases of sickness.

20. With respect to the serious genetic effects, there is no doubt that certain forms of radiation can cause harm. However, this field of study is so intricate and relatively unknown, that no reliable scientist will attempt a categorical statement. It is estimated that approximately 4 percent of the children who are born today are born defective. Current estimates indicate that as a result of nuclear war, an additional one per cent might be born defective in future generations. While even this is a horrible price, it is far from annihilation.

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21. DO CIVIL DEFENCE PREPARATIONS HINDER EFFORTS FOR DISARMAMENT?

The policy of the Government of Canada is that every worthwhile effort should be made by all governments to reduce the causes of war and that it will do everything in its power to make disarmament a reality. However, it is recognized that wars may start and should they start, whatever advance preparations have been made, then the better the chance of populations surviving. Wishful thinking will never bring about the end of war, nor will it bring about disarmament any more than wishful thinking will do away with sin.

22. No government can honestly base its policies on an assumption that war will not occur.

23. It should be noted that Soviet Russia has a vigorous program of civil defence, although it is not known by that title in Russia. One of their most recent publications, published in 1958, is "Defence Against Weapons of Mass Destruction" (price 3 rubles). It is doubtful whether any public debate on such vital issues of defence and disarmament take place in that country as they do in a democratic country like Canada and the United States. Those who would do away with Canada's defensive efforts, be they civil or military, completely ignore the fact that we could be subjected to blackmail or invite open aggression because we would not have the capability of making even a token defence. One does not protect his home from fire by ignoring fire regulations or disbanding the fire services.

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ANNEXES

ANNEX A	-	Assumptions
B	-	Statement by the Government of Canada on Policy concerning Evacuation and Shelter for Civil Defence Purposes
C	-	Alberta Emergency Measures Organization
D	-	Casualties from Nuclear Weapons
E	-	Radiation Hazard Information
F	-	National Survival Attack Warning System

DISTRIBUTION

As per distribution list in Alberta Survival Plan,
Volume One, (page 8)

ANNEX A to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

ASSUMPTIONS

GENERAL

1. Before commencing the formulation of plans, all assumptions having any relevance to the task should be reviewed so as to form conclusions on which to base the best possible operational plan.

2. Detailed assumptions are set out hereunder so that reasonable conclusions can be formed.

3. All possible situations may not be covered by these assumptions, and others might be considered by Planning Staff when drawing up particular plans. However, any additional assumptions must be consistent with those elaborated in this Annex.

SCALE AND PATTERN OF ATTACK

4. Since the scale and pattern of attack on North America in general, or on Canada in particular, cannot be predicted with accuracy, the following very general assumptions have been made:

   a. An assault on the North American continent would probably take the form of nuclear weapons delivered by bombers, submarine-launched missiles, and intercontinental ballistic missiles (ICBM) launched from land bases. Missiles will progressively replace bombers as the chief means of delivery.

   b. Canada might not be the primary object of direct attack. However, no area in the Dominion is considered to be safe from the effects of nuclear weapons, i.e. fallout or the detonation of bombs dropped at random. Manned bombers, intercepted over Canada, might jettison their loads on the nearest most opportune target, and even bomb bursts in open country would create radioactive fallout hazards.

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c. The basic problem will be how to survive. The first few days of a nuclear war are likely to be the worst.

d. The use of weapons having a yield (or size) of up to 20 megatons may be expected against North America. As a 5 megaton bomb could completely destroy any Canadian city, survival planning in this country is based on the assumption that weapons of that size would be employed by the enemy.

e. Nuclear weapons can be detonated as either air bursts or surface bursts with an aimed accuracy of less than two miles from the centre of the target.

f. Biological and Chemical Warfare. The possibility of the use of biological and chemical warfare to cause casualties, spread confusion, impair morale and reduce the will to resist must not be disregarded. This type of attack could be carried out by manned bombers or missiles.

g. Psychological Warfare. The danger from psychological warfare is ever present. This form of warfare aims at undermining confidence in leadership and weakening the will to fight.

ATTACK PHASES

5. The progress of a nuclear war can be divided into two distinct periods or phases requiring flexibility of planning in respect of certain requirements. The phases are:

a. Shock Phase - a period of approximately 30 days during and immediately after the initial attack;

b. Recovery Phase - a period of rehabilitation and reconstruction after the danger of further attack has passed.

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EFFECTS OF A NUCLEAR ATTACK

6. The height of burst and energy yield of a nuclear explosion are important factors in determining the extent of damage above ground. With a 5-megaton weapon the optimum height of burst of 12000 feet will cause maximum blast damage. However, the fireball must make contact with the ground to create the problem of fallout. A contact (or ground) burst is at 9000 feet or under. The closer the burst is to the ground, the greater is the fallout problem. The effects that can be expected to follow a 5-megaton explosion would be as follows:

a. Blast Damage Zone - Measured in rings in a radius outward from Ground Zero:

    (1) "A" Ring - complete devastation out to 3.1 miles.

    (2) "B" Ring - severe damage out to 6.3 miles. Buildings in this area would be damaged beyond repair.

    (3) "C" Ring - moderate damage out to 10.1 miles. Many buildings would be beyond repair and uninhabitable.

    (4) "D" Ring - partial damage out to 12.6 miles. Few buildings in this area would escape damage of some kind.

b. Lethal radioactive fallout would extend downwind, usually fanning out in a cigar-shaped mass, up to forty or fifty miles wide and several hundreds of miles long, affected by the velocity and vagaries of the wind.

c. Cities subjected to a nuclear attack would suffer a large percentage of casualties in killed and injured. Advance warning and/or sound civil defence planning would reduce the number of casualties.

d. In the main, normal communications and transportation facilities would cease to exist.

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e. Stocks of food, fuel and other essential supplies, if not destroyed, would probably be inaccessible for a lengthy period because of radiation hazards.

f. A random bomb explosion over open country would produce, at least, fallout hazard to life and damage to property, and might render large areas, complete with their facilities, unusable and inaccessible for a considerable period.

WARNING.

7. It is unlikely that any considerable period of pre-attack warning of hostile action against the North American continent would be received by the Armed Forces responsible for alerting the general public. Available warning time against manned bombers is presently estimated at a maximum of two hours. When a potential enemy has the capability of launching a major attack with ICBM's, maximum warning time may be reduced to fifteen minutes or less. However, survival plans must be sufficiently flexible to take advantage of any additional warning time which might be available.

PROBABLE TARGET AREAS

8. For planning purposes, the following are regarded as the most probable target areas in Alberta:-

a. Edmonton;

b. Calgary.

GOVERNMENT

9. There will be disruption of normal peacetime government. Plans must provide for the continuity of civil authority, adequately decentralized and capable of continuing the essential emergency functions of government at the federal, provincial and municipal levels.

SUPPLIES

10. a. The Federal Department of Defence Production has been given the task of making the various peacetime arrangements necessary to permit a War Supplies Agency to come into effective existence immediately on the outbreak of a nuclear

war. The War Supplies Agency would have the full responsibility for all aspects of control over the production, distribution and pricing of supplies, both civil and military, other than production on the farm and the catching and landing of fish. To carry out the planning task an Emergency Planning Branch has been formed within the department. The Department of Defence Production is also responsible for any federal government-sponsored program of production and stockpiling for emergencies, except medical supplies. (Medical supplies are being stock-piled by the Department of National Health and Welfare with the assistance of the Department of National Defence.) The operation of the War Supplies Agency will require the assistance of provincial and municipal Agencies.

b. The provision and distribution of essential commodities will be difficult and complex. An immediate scarcity of vital supplies may be caused by one or more of the following factors:

(1) Destruction or contamination of water and supplies;
(2) Influx of evacuees;
(3) Hoarding by individuals;
(4) Breakdown of normal transportation systems;
(5) Dislocation of basic industry;
(6) Power failures;
(7) Gas failures.

c. Immediate survival needs will probably have to be met from surviving stocks of ready-to-use items rather than from new production.

d. The commodities most urgently required would be:

(1) Potable water;
(2) Medical and surgical supplies;
(3) Foods essential to health (including baby foods);

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(4) Fuel, including that which is essential for transportation;

(5) Clothing, shoes, blankets, etc.,

(6) Materials and replacement parts for transportation equipment, public utilities, communications and roads.

e. By the end of the shock phase, planning requirements should give special consideration to the need for:

(1) Building materials and tools;

(2) Heating and electrical supplies;

(3) Household appliances and furniture.

f. Agricultural production and measures for protection of farms and farm produce against wartime hazards such as radioactive fallout, are the direct concern of the federal and provincial Departments of Agriculture. The catching and landing of fish is a planning responsibility of the federal Department of Fisheries and of the provincial Department of Lands and Forests.

TRANSPORTATION

11. Responsibilities. Planning for emergency transportation services by air, rail and water is the primary responsibility of the federal Department of Transport. Planning for the organization, use and control of road transport in an emergency is a function of the Federal Emergency Measures Organization. Planning and operations of emergency transportation services will require the assistance of provincial and municipal Agencies.

12. a. The disruption of transportation as a result of nuclear attack would be inevitable. The demands for transportation services will therefore be of particular concern. Isolation of certain areas from outside contact by rail, road, air or water for varying periods of time is a distinct possibility. Loss of major fuel stocks alone could bring transportation to a halt over a wide area.

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These possibilities emphasize the necessity for planning on a wide decentralization of control over transportation operations; planning for the pooling of all available transportation resources is a major consideration.

b. Railways are particularly vulnerable to attack since they pass through probable target areas, where their major installations also are situated. Alternate routes exist to some extent, but are probably too few in number and too inflexible to provide an assured means of by-passing damaged areas quickly. Repairs to track and signal facilities could take considerable time under the best of circumstances, while a damaged bridge might block a railway line for months.

c. Rail disruption would increase the work load on road transport. Therefore, road transportation would inevitably be taxed to capacity, particularly during the shock phase.

d. The use of aircraft may be restricted owing to diversion, limited aviation fuel stocks, and the destruction of airport facilities. The movement of key personnel and urgent items such as medical and food supplies is likely to have the highest priority.

COMMUNICATIONS

13. What has been said about the possible effects of a nuclear attack on railways could be equally applicable to commercial communication facilities. These follow the railway lines with few by-pass routes around large centres. Telephone and telegraph landlines could probably be disrupted, if not destroyed, in many places. Radio will be the principal means of communication available in many parts of the country, particularly during the shock phase. Instructions and information to the public might have to be given almost entirely by the Emergency Broadcast Network. An Emergency National Telecommunications Organization has been

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authorized to act in peace-time as a nucleus for planning purposes, and, in an emergency, to control and administer the National Telecommunications System.

MANPOWER

14. a. Plans for the re-employment and movement of manpower (except medical) are the responsibility of the federal Department of Labour and the Unemployment Insurance Commission. With regard to medical manpower, responsibilities are shared by the Department of National Health and Welfare, the Department of National Defence and the Alberta Department of Public Health. Provincial and Municipal Agencies will be vitally concerned with the control of manpower.

b. Manpower is a critical factor in wartime, and its proper utilization and allocation must be planned with the utmost flexibility in mind.

c. Major tasks which are most likely to make demands on manpower planning, particularly during the shock phase, are:

(1) Assistance in the conduct of survival operations including rescue, first aid, traffic control, firefighting, auxiliary police, decontamination, and radiation monitoring;

(2) Provision of hospital and medical services and preservation of public health generally;

(3) Clearing operations and the restoration of transportation and communication facilities;

(4) Distribution of essential supplies;

(5) Maintenance of government authority, law and order;

(6) Repair of public utilities, particularly water, sewage disposal, power, and other emergency repairs of all kinds;

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(7) Mass care and feeding of evacuees and other forms of welfare work.

d. After the shock phase, new job priorities would begin to emerge. A continual re-assessment of manpower problems and flexibility in the use of manpower are the most likely requirements.

FINANCES

15. a. The Department of Finance, together with the Bank of Canada, is responsible for all planning which relates to wartime financing by government at all levels, banking and currency during the survival period, moratoria on debt payments, emergency financial support for individuals and business, and international transactions. Implementation of these aspects of financial control will involve the establishment of provincial and municipal agencies.

b. The disruption of normal methods of financing might well prove disastrous unless adequate planning has been undertaken in advance.

ACCOMMODATION

16. a. The problem for accommodation for people in the event of nuclear attack has four quite distinguishable aspects:

(1) Protective shelter against blast or radioactive fallout;

(2) The billeting of evacuees in private homes, institutions, hotels, etc.,

(3) Short-term repair to lightly damaged buildings, simple emergency construction, accommodation and adaption of surviving large buildings to relieve immediate congestion in overcrowded reception areas;

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    (4) Long-term replacement of lost stocks of houses and other residential premises.

b. The billeting of evacuees reaching reception areas in large numbers requires:

    (1) Planned preparation and an organization to carry out the task;

    (2) Recognition that the immediate task must be to get evacuees into some sort of accommodation followed by the registration and reunion of families.

c. Initially, payment could not be expected to be a consideration in billeting.

CONCLUSION

17. This Annex has attempted to present in a general manner, some assumptions covering problems which can be expected in the event of a nuclear war. They will assume greater or lesser importance in particular planning requirements. Certain departments and agencies of government have already formulated basic plans to deal with their particular problems. How well these plans will work will depend upon the co-operation, organization and training for such emergencies by government at all levels and the support of the general public.

ANNEX B to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

STATEMENT BY THE GOVERNMENT OF CANADA on POLICY CONCERNING EVACUATION AND SHELTER FOR CIVIL DEFENCE PURPOSES

as announced by

Right Hon. J.G. Diefenbaker

Prime Minister

on

November 20, 1959

The Prime Minister, the Right Honourable John G. Diefenbaker, announced today that he has written to the Provincial Premiers on the subject of evacuation and shelter policy in Civil Defence.

The Government's views on the subject were outlined at the Dominion-Provincial Conference on Civil Defence Arrangements, held in Ottawa early in October, and the Minister of National Defence, the Honourable George R. Pearkes, V.C., said that the views would be reviewed in the light of the discussions at the Conference.

This review has now been carried out and the views of the Government with regard to the problem have been embodied in a statement sent to the Provincial Premiers, a copy of which is attached. In summary, the Federal Government's belief is that civil defence planning should be based on four major principles or features, namely:

(a) The need to provide for some means of protection against radioactive fallout;

(b) The voluntary dispersal from major cities of persons not required for essential tasks, to the extent that time may permit;

(c) Preparations for the reception and care of evacuees in smaller communities and rural areas; and

(d) Arrangements for removing persons from areas heavily contaminated by fallout.

STATEMENT BY THE GOVERNMENT OF CANADA ON POLICY CONCERNING EVACUATION AND SHELTER FOR CIVIL DEFENCE PURPOSES

Should a war occur, attacks on Canada by large nuclear weapons would be expected. Major Canadian cities might be selected as targets, although what priority cities would receive in comparison with other targets is conjectural at best. Furthermore, there would be an equally serious risk from attacking bombers being shot down over Canada with their bombs set to explode, or from missiles going astray from their targets.

Additional to the damage done in this way, there would be a widespread danger from radioactive fallout which would render it unsafe to be in some areas without substantial protection, or to be out-of-doors for more than very brief periods.

Although it is expected that in times of anticipated peril, many people will wish to leave the cities which are considered to be the more likely targets to take refuge in other less dangerous parts of the country, the Government considers that Canadians should not be compulsorily required to leave their homes for the result might well be that in avoiding one danger other risks would thereby be incurred.

At the same time we believe that proper provision should be made so that people desiring to leave the more likely target areas can do so, excepting of course that persons in certain classes of occupations must be asked to remain at their posts to safeguard essential utilities and services.

It is generally expected that in the event of attacks by bombers there would be sufficient warning time to allow many people to leave, if efficient traffic arrangements are planned in advance. On the other hand, when missiles are used, warning time will be reduced to a few minutes.

While as stated the Government does not propose to adopt a policy of compulsory evacuation of target areas on the outbreak of war, preparations should be made to enable those who wish to move to do so in an orderly manner so as to avoid confusion and keep panic to a minimum.

While shelters would be of considerable help in saving lives, to achieve a substantial amount of protection against a nuclear explosion itself would require a type of shelter that would be very costly. The Government is studying what might be achieved by anti-blast shelters in target areas, their cost, and how that cost might fairly be distributed. Complete protection cannot be achieved at any cost close to the explosion itself, as anti-blast shelters could not possibly be built in every area where a bomb or missile might fall. The Government does not intend to reach a decision to build this type of shelter which in any event would provide a limited degree of protection until it is possible to assess its usefulness and cost.

It seems clear that substantial protection from radioactive fallout can be secured by individual households at reasonable cost. Relatively simple family refuges or shelters can be built in the basements of existing buildings for two or three hundred dollars. The Government will at an early date publish a pamphlet giving detailed suggestions for those wishing to provide this kind of protection for their families. Somewhat more

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costly backyard shelters can be built in homes without basements, but further study is required before a suitable type can be recommended to the public.

The provision of shelters against fallout for larger than family groups appears to be desirable and to this end the Dominion Government has proposed that the federal, provincial and municipal authorities jointly carry out surveys of existing large buildings to ascertain what protection they could afford.

While the foregoing represents its views, the Government intends to keep these problems under constant examination and to revise plans in this field from time to time as circumstances and events may make necessary.

November 19, 1959.

ANNEX C to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

ALBERTA EMERGENCY MEASURES ORGANIZATION

OBJECT

1. The object of this paper is to outline the Emergency Measures Organization in Alberta.

GENERAL

2. On the recommendation of the Minister-in-Charge of Civil Defence the Executive Council approved the reorganization of Alberta Civil Defence into the Alberta Emergency Measures Organization by Order-in-Council 1016/60, dated 5 July 1960.

3. The responsibilities of the Alberta Emergency Measures Organization include planning for Continuity of Government and Civil Defence.

4. The aims of the Emergency Measures Organization and Civil Defence are to prevent unnecessary loss of life and to ensure the Continuity of Civil Government --- Federal, Provincial and Municipal.

5. The basic principles upon which the Emergency Measures Organization and Civil Defence in Canada have been established are:

   a. The utilization of existing agencies, Governmental and non-Governmental,

   b. The acceptance of responsibility by each level of Government,

   c. The acceptance by each individual citizen of his responsibility with respect to his own self preservation and mutual aid between his neighbour and himself.

RESPONSIBILITIES

6. The Alberta Emergency Measures Organization is responsible for:

   a. Development of an overall provincial program of Emergency Planning, including the preparation of an

............/2.

Alberta Survival Plan,

b. Stimulation and co-ordination of Emergency Planning within the several departments of Government,

c. Preparation of plans for emergency headquarters for Government,

d. Detailed Emergency Planning in areas not specifically the responsibility of other Government departments,

e. Co-ordination of planning in the various areas of Civil Defence responsibility which have been, or shall be, assigned to other Government departments or agencies,

f. Liaison with the Emergency Measures Organization of the Government of Canada and the several Federal Government departments having Emergency Planning responsibility,

g. Conducting a training program covering matters relating to emergency operation of Government, for personnel of Government departments,

h. Assistance to Municipalities in the development of a national survival and Civil Defence program,

j. Co-ordination of plans for the decentralization of Government authority and functions if circumstances should so require.

ORGANIZATION

7. A chart of the Alberta Emergency Measures Organization showing the channels of responsibility for direction, co-ordination and/or liaison is attached. The various components are listed hereunder and their main Civil Defence functions are defined in succeeding paragraphs:

a. Cabinet Committee on Emergency Measures,

b. Provincial Standing Committee,

c. Headquarters Alberta Emergency Measures Organization,

d. Provincial Government Departments,

e. National and Provincial Organizations.

......./3.

8. Cabinet Committee on Emergency Measures - This Committee gives policy guidance in all areas of survival planning and development, as considered necessary.

9. Provincial Standing Committee.

a. The Provincial Standing Committee has overall direction of planning emergency activities in the Province of Alberta. This Standing Committee consists of:

   (1) The Premier of Alberta or his representative,

   (2) The Regional Director, Federal Emergency Measures Organization,

   (3) The Commander, Alberta Area, Canadian Army (Regular),

   (4) The Officer Commanding "K" Division, RCMP, or his representative,

   (5) The Co-ordinator, Alberta Emergency Measures Organization.

b. The Standing Committee has authorized liaison and planning by all agencies concerned to draw up and complete the plans necessary to meet a National Survival Emergency.

10. Headquarters Alberta Emergency Measures Organization. The Organization and functions of this Headquarters may be summarized as follows:

a. Co-ordinating Committee. The Deputy Ministers of each department of Government are members of this Committee, together with the Co-ordinator and Deputy Co-ordinator, Alberta EMO, and other members designated from time to time by the Minister responsible for Emergency Measures. The emergency plans for all departments of Government and other agencies will be reviewed by the Co-ordinating Committee and, if approved in their original or amended form, shall be forwarded to the Minister of the Department to which they refer, for his approval, and if approved shall be forwarded to the Minister responsible for Emergency Measures for his approval and issue as part of the Alberta Survival Plan.

...../4

b. The Headquarters Alberta EMO is divided into:

(1) Continuity of Government Division - divided into planning and operation sections and responsible for assisting Government Departments in their Continuity of Government arrangements.

(2) Training Division - to Operate all provincially sponsored schools, including schools for Alberta Government employees.

(3) Administration Division - responsible for all administrative arrangements.

(4) Civil Defence Division - divided into planning and operation sections and responsible for public arrangements.

c. Alberta EMO Zones. - The Zones are part of the Provincial Organization. Each Zone is a geographic area of the Province with a Headquarters established at a peace time location. The purpose of the Headquarters is:

(1) In Peace-Time - to provide assistance to Municipalities in the development of their survival program.

(2) During Emergencies - to co-ordinate and direct as necessary the activities of all the Municipalities within the Zone in aid of a stricken area, or areas affected by the emergency.

NOTE: ZONE ORGANIZATION IS CONSIDERED IN MORE DETAIL IN APPENDIX 1 ATTACHED TO THIS ANNEX.

11. Provincial Government Departments. Under the provision of Order-in-Council 1016/60 dated 5 July 1960, the Minister of each department of Government has appointed a senior officer of his department as Departmental Emergency Planning Officer who is responsible to him for the following duties:

......../5.

a. To examine the functions of his department and establish those which must be continued, expanded or suspended, during an emergency.

b. To initiate, with the assistance of Headquarters Alberta Emergency Measures Organization, the preparation of departmental plans covering the organization and training for the continuity of functions of the department.

c. To prepare and implement, plans, with the assistance of the Headquarters Alberta Emergency Measures Organization, for the preservation of documents, records and information required, for the protection of the rights and interests of individuals and for the effective operation of the department in an emergency.

12. Completed departmental plans will be forwarded to HQ Alberta EMO for review and inclusion in the Alberta Survival Plan.

13. National and Provincial Organizations. These Organizations are ready to co-operate and, as in past disasters, to accept responsibilities for certain emergency measures at all levels of Government.

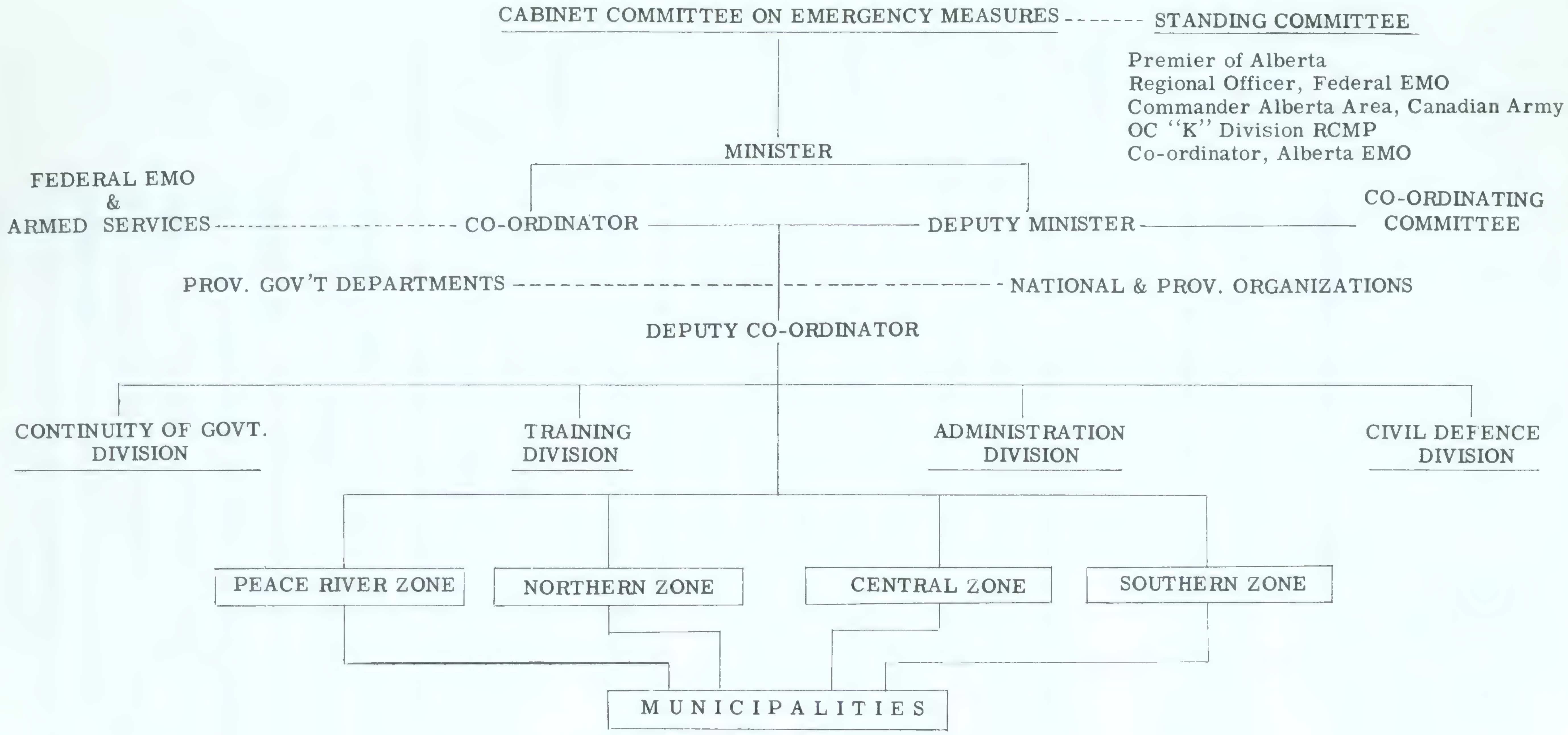
14. Municipalities. Municipalities are encouraged to form Civil Defence Organizations under the provisions of the Civil Defence and Disaster Act. The details of Organization and Responsibilities for Municipalities is described at Appendix 2 to this Annex under the heading "Municipal Civil Defence Organization.

APPENDICES

1 - Alberta Emergency Measures Zones - Organization and Responsibilities

2 - Municipal Civil Defence Organization

ALBERTA EMERGENCY MEASURES ORGANIZATION



HQ Alberta EMO
Edmonton
15 August 1960

——— Direction
- - - - Co-ordination and/or Liaison

APPENDIX 1 to
ANNEX C to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

ALBERTA EMERGENCY MEASURES ZONES

OBJECT

1. The object of this paper is to outline the organization and responsibilities of The Alberta Emergency Measures Organization Zones in Alberta.

GENERAL

2. In order to undertake certain responsibilities of The Alberta Emergency Measures Organization, Zones have been established in Alberta. A Zone is the decentralized Provincial authority below the Provincial Headquarters. Each Zone is a geographic area of the Province with a Headquarters established at a peace time location. The purpose of the Headquarters is:

a. In Peace-time - to provide guidance and assistance to Municipalities in the development of their survival program.

b. During Emergency - to co-ordinate and direct as necessary the activities for survival of Municipalities within the Zone in aid of a stricken area or areas affected by the emergency.

ORGANIZATION

3. Alberta is divided into four Zones and the Headquarters for each Zone has a minimum full-time Staff appointed by the Alberta Emergency Measures Organization. Zones have been established as follows:

a. Peace River Zone - the Northern portion of the Province with Headquarters located in the City of Grande Prairie.

b. Northern Zone - an area surrounding the Edmonton Target Area, with Headquarters located in the City of Edmonton.

c. Central Zone - an area surrounding the Calgary Target Area, with Headquarters located in the City of Calgary.

d. Southern Zone - the Southeast portion of the Province which includes the Cities of Lethbridge and Medicine Hat, with Headquarters located in the City of Lethbridge.

......./2.

4. During an emergency each Zone Headquarters will be the centre of Emergency Government for the Zone, acting under the authority and direction of Regional Emergency Headquarters. The Headquarters will be staffed by Federal (including Canadian Army)/ Provincial Officials who have survival functions to perform.

5. The Northern and Central Zones each include a probable Target Area designated by the Federal Government. A Target Area is an area normally extending out to a radius of 15 miles from the assumed Ground Zero. Ground Zero (GZ) is the point on the earth's surface directly below or above the centre of a nuclear explosion. During an emergency the Headquarters for the Northern and Central Zones will be located in less vulnerable areas.

6. Because of the large number of Municipalities within each Zone, Municipalities must organize jointly with adjacent Municipalities within the boundaries of a County or Municipal District to form Civil Defence Units. This type of organization is considered essential to provide economy of effort and efficiency of operation in an emergency.

RESPONSIBILITIES

7. The more detailed responsibilities of Zones include:

   a. Assisting Municipalities to develop their Civil Defence Organizations and encouraging Unit development.

   b. Assisting Municipalities to prepare their Survival Plans.

   c. Assisting Municipalities in their recruitment and training programs.

   d. Establishing, together with Federal (including Canadian Army), an operational emergency Headquarters.

   e. Co-ordinating, together with Federal (including Canadian Army), the establishment of Garrison Forces Sites for Target Areas. (Garrison Forces are referred to under Municipal Organization in Appendix 2.)

   f. Co-ordinating, in conjunction with other agencies concerned,

........./3.

the voluntary movement of evacuees from the Target Areas and their reception elsewhere within their respective Zones.

g. Co-ordinating remedial evacuation (where necessary) in conjunction with the Canadian Army.

h. Maintaining liaison with HQ Alberta EMO, Provincial Government Departments and local Military formations.

CHANNEL OF COMMUNICATIONS

8. The Channel of Communications will be:

a. In Peace-Time:

(1) Minister-in-Charge, Alberta Emergency Measures Organization

to

(2) Co-ordinator, Alberta Emergency Measures Organization

to

(3) Officer-in-Charge, Alberta Emergency Measures Organization Zones

to

(4) Unit Director of Civil Defence (where established)

to

(5) Municipal Director of Civil Defence.

b. During Emergency:

(1) Regional Emergency Headquarters

to

(2) Zone Headquarters

to

(3) Unit Civil Defence Headquarters (where established)

to

(4) Municipal Civil Defence Headquarters.

APPENDIX 2 to
ANNEX C to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

MUNICIPAL CIVIL DEFENCE ORGANIZATION

OBJECT

1. The object of this paper is to outline Municipal Civil Defence Organization in Alberta.

INTRODUCTION

2. Civil Defence should not be considered as something apart from local civic government but rather a logical and necessary extension of existing Government and other Agencies, to deal with disaster situations.

3. In survival planning, where there is no corresponding civic department of Government to be responsible for a particular requirement, arrangements must be made by the Municipality to undertake the tasks and functions required. Volunteers must be recruited and trained.

ORGANIZATION

4. The responsibility for the development of Civil Defence at Municipal level rests with the Mayor and Council. The Mayor and Council must, therefore, provide the required leadership so that their citizens are aware of those measures necessary for their survival.

5. A Suggested Municipal Civil Defence Organization is shown in chart form as an Attachment to this Appendix. A description of this organization is given below.

6. Civil Defence Control Committee - This Committee should consist of the Mayor, at least one Councillor, and, if the Council should desire, responsible citizens may be appointed. The Chairman should be a Councillor. The Civil Defence Control Committee should be legalized by Council. (In Target Areas the Control Committee should consist of elected representatives of each of the Municipalities making up the Target Area). The main functions of the Control Committee include the:

a. Establishment, with Council approval as necessary, of all policy relating to the development of the organization,

............./2.

b. Appointment of the Director of Civil Defence. This appointment should be confirmed by resolution by the Council.

c. General supervision of all Civil Defence work.

d. Consideration of reports submitted by the Director of Civil Defence.

e. Approval of Civil Defence plans prior to their submission to Council for ratification.

7. The Director of Civil Defence - The Director of Civil Defence should be selected for his ability to organize; his willingness to serve in the best interests of the Municipality; and, above all, his ability to inspire the respect and co-operation of the people. Depending on the size of the Municipality, the Director might be employed full or part time. His status, must be the equivalent to that of senior Municipal officials. The duties of the Director include:

a. Under the authority and control of Council and the Control Committee, the co-ordination of the Municipal organization established to deal with survival and natural disaster planning and operations. In effect, the Director of Civil Defence is the Chief Staff Officer to the Council and Control Committee and acts under their authority during a survival or natural disaster operation.

b. Submission of recommendations to the Control Committee on all Civil Defence and Civil Emergency Planning matters.

c. Reporting regularly to the Control Committee.

d. Implementation of the policy and plans approved by the Control Committee and/or Council.

e. Development of the Civil Defence Organization, as outlined in Attachment III to this Appendix.

f. Recommendations to the Control Committee for appointment:

    (1) A Deputy Director of Civil Defence (if required).

........./3.

[illegible]

[illegible] qualifications.

[illegible] ability to organize; his abilities [illegible]

[illegible] the supply and preparation of the goods. [illegible]

[illegible] to that of [illegible]

[illegible]

(2) Key Civil Defence Service Personnel. (Existing Municipal officials where appropriate should be appointed).

(3) A Planning Committee.

g. Establishment of an Emergency Headquarters and Control Centre.

8. The Planning Committee - Responsible to the Control Committee for the preparation of a Civil Defence Plan for the Municipality. The size of the Planning Committee will be governed by local conditions but should include the senior official of each Municipal and Civil Defence Service and representatives from other agencies within the Municipality who will participate in survival measures and who have special skills and knowledge useful for the drafting of the Plan.

9. Civil Defence Services - The Civil Defence Services, known as the Civil Defence Corps are listed below. It will be noted that a nucleus of each of the services, which are required for Civil Defence operations, actually exist in many municipalities. The existing Municipal services are established for everyday Municipal business, but they would not be sufficient to meet major disasters and consequently must be expanded by the utilization of trained volunteers.

a. Headquarters Service - comprising two (2) branches:

(1) Operations Branch.

(a) Operations Section

(b) Intelligence Section

(c) Training Section

(d) Communications Section

(2) Administration Branch.

(a) Personnel Section

(b) Supply Section

(c) Transportation Section

b. Fire Service - the existing service should be expanded by trained volunteers;

........./4.

c. Police Service - the existing service should be expanded by trained volunteers;

d. Warden Service - consisting mainly of trained volunteers; (The Chief Warden could be a police officer.)

e. Rescue Service - consisting mainly of trained volunteers; (The Chief Rescue Officer should probably be from the Engineers or Public Works department.)

f. Health Service - consisting of all Health and Medical Services available in the Municipality, and supplemented by trained volunteers;

g. Welfare Service - consisting of all public and private Welfare Agencies and Organizations, supplemented by trained volunteers;

h. Engineer and Public Utility Restoration Service - consisting of existing municipal engineering and utility personnel, and private firms which have engineering and construction personnel and supplies.

DEVELOPMENT

10. In the development of Civil Defence in a Municipality it is recommended that the Municipal Council follow the three basic steps listed below. Once these steps have been completed the Civil Defence Organization can progress fairly rapidly.

a. Pass a Civil Defence By-law - After two readings, the By-law must be submitted in duplicate to the Minister-in-Charge of the Alberta Emergency Measures Organization for approval before the third and final reading by Council. This by-law establishes the Branch of the Municipal Government to be known as the Civil Defence Organization, authorizes the Municipality to budget funds for Civil Defence and Council to co-operate with Councils of other municipalities to form a Civil Defence

............/5.

Unit. (A Model Civil Defence By-law is attached as Attachment II to this Appendix.)

b. Appoint a Civil Defence Control Committee - Appoint a Committee as described in paragraph 6.

c. Appoint a Director of Civil Defence - Appoint a Director of Civil Defence as described in paragraph 6 a.

11. Target Area Organization - Target Areas, which include the Edmonton and Calgary areas, should organize in the same manner as a Civil Defence Unit (see paragraph 14, for Civil Defence Units) with the following additional arrangements.

a. For control purposes the Target Area should be divided into:

(1) Sub-Divisions - conforming to natural boundaries as far as possible, e.g., rivers, railroads, etc.

(2) Drainage Areas - areas within sub-divisions which are associated with particular withdrawal routes.

(3) Sectors - a much smaller area established within a sub-division for control purposes in an emergency.

b. Target Area authorities should plan for the dispersal of Municipal and Civil Defence Services to pre-arranged Garrison Force Towns on the perimeter of the Target Area. Such plans must be sufficiently flexible to take advantage of any time available for dispersal. From these locations the following action would be possible:

(1) Patrol and protection in the Target Area, by the essential services, e.g., Fire, Police, Public Utilities, etc.

(2) Support to the Canadian Army in the event that re-entry operations have to be conducted.

12. Civil Defence Unit Organization - Attachment III to this Appendix is a suggested approach to the development of a Civil Defence Unit Organization.

......../6.

CONCLUSION

13. The object of this paper has been to outline Municipal Civil Defence Organization and to point out the necessity for development on a Unit basis.

ATTACHMENTS

I - Municipal Civil Defence Organization Chart.

II - Model By-law for the Establishment of a Civil Defence Organization.

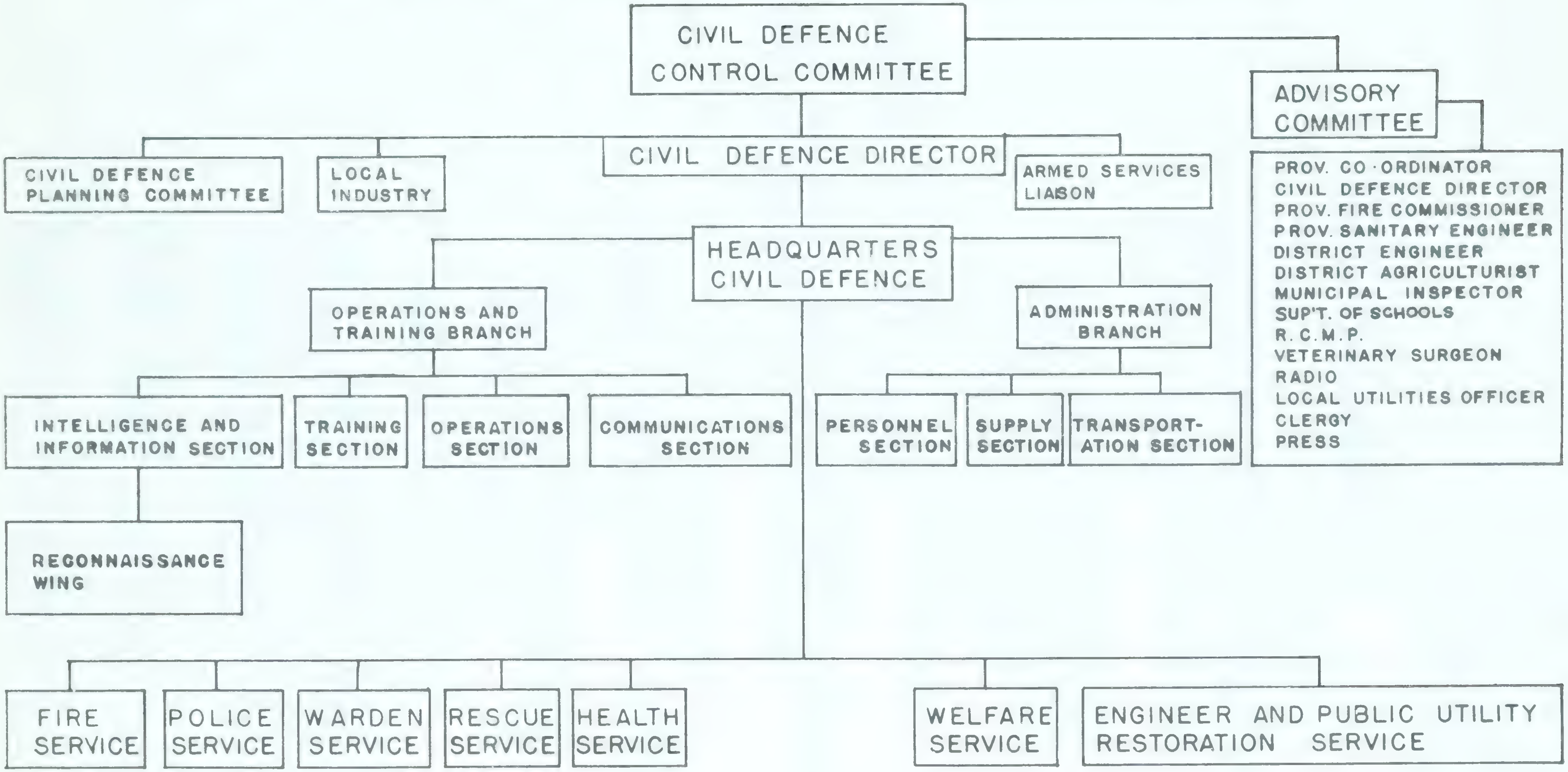
III - Development of a Civil Defence Unit Organization.

IV - Civil Defence Unit Chart.

ATTACHMENT 1

APPENDIX 2 TO
ANNEX C

SUGGESTED MUNICIPAL CIVIL DEFENCE ORGANIZATION



Attachment II to
APPENDIX 2 to
ANNEX C to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

Model By-law for the Establishment of a Civil Defence Organization

WHEREAS The Civil Defence and Disaster Act, by section 7, that:

"7 (1) A municipality may establish a local organization to deal with matters relating to civil defence and disaster" and

"7 (5) The council of a municipality that sets up a civil defence organization may

(a) by by-law approved by the Minister, borrow, levy, appropriate and expend, without the consent of the burgesses, such sums as are required for civil defence purposes or in connection with a disaster within or without the boundaries of the municipality"

AND WHEREAS it is desirable in the public interest that an organization to deal with matters relating to civil defence and disaster be established for the (name of municipality)

AND WHEREAS it is deemed expedient and advisable in the interests of a more efficient and economical civil defence effort, that the council be authorized to co-operate with the councils of other municipalities in the establishment of a Civil Defence Unit

THEREFORE the council (name of municipality) enacts as follows:

1. There is hereby established a branch of the municipal government to be known as the ____________________ Civil Defence Organization.

2. (1) There is hereby established a Civil Defence Control Committee which shall consist of not less than three members, who shall be appointed by resolution.

   (2) At least one of the Control Committee shall be a member of the council.

3. The council, on the recommendation of the Civil Defence Control Committee may, by resolution, appoint a Director of Civil Defence who shall be in charge of the Civil Defence Organization and who shall be responsible to the Council for the implementation of any programme or plan established by the Council for dealing with civil defence or disaster.

4. The Council may, from time to time, borrow, levy, appropriate and expend monies required to meet the ordinary operating expenses of the said organization.

5. The Council may co-operate with the Councils of other municipalities for the purpose of jointly establishing and operating a Civil Defence Unit.

6. The Council may appropriate and expend such sums as may be agreed upon to provide for the organization and operation of the Civil Defence Unit.

This by-law comes into force on the day it is finally passed,

Approved:

read a first time__________19__

____

read a second time________19__

Minister-in-Charge
Alberta Emergency Measures

read a third time__________19__

and finally passed this_________

day of____________________19__

Date:________________________

____
Mayor or Reeve

____
Secretary-Treasurer

(Note) This By-law should be given two readings and then submitted to the Minister in charge of Alberta Emergency Measures for approval before the third and final reading. It is requested that the By-law be submitted via Alberta Emergency Measures Organization for recording and administrative purposes.

Attachment III to
APPENDIX 2 to
ANNEX C to
Alberta Survival Plan
Volume Two
Dated: February 1961

DEVELOPMENT OF A CIVIL DEFENCE UNIT ORGANIZATION

GENERAL

1. A Civil Defence Unit consists of a County or Municipal District, together with the incorporated Cities, Towns and Villages within the County or Municipal District boundaries, which is legally established as one Organization for Civil Defence development and operation.

2. This type of development is essential after the establishment of a Municipal Civil Defence Organization and will provide distinct advantages which include the following:

a. In overall Zone development, fewer Municipal contacts will be necessary and, therefore, more time may be spent with each Unit on individual development.

b. The several Municipal Civil Defence services can be brought together to provide a more effective service, e.g., each of three small villages could provide one rescue party to be combined into one Rescue Team.

c. Training may be more efficiently and economically arranged.

d. A larger group of people will be available from which to secure capable leaders.

e. In time of emergency a Civil Defence Unit Headquarters would be the only headquarters within the Unit required to communicate with the next higher formation headquarters. Consequently, no one headquarters - in particular Zone Headquarters - would be over-loaded from the communications point of view and this would result in more effective control and direction within the Zone.

3. The following steps and procedures are recommended for the development of Civil Defence Units:

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a. An initial joint organizational meeting should be arranged with representatives from each Municipal Council. (The Reeve/Chairman and Mayor of all Municipalities concerned should be approached to secure adequate representation). This meeting should elect a Chairman and appoint a Secretary to record the minutes. The purpose of this meeting would be:

(1) To outline the advantages of setting up a Civil Defence Unit. (To be made by the appropriate Zone Officer).

(2) By resolution agree:

  (a) To joint action for Civil Defence by forming a Civil Defence Unit comprising all Municipalities concerned. (Name all Municipalities).

  (b) That all Municipalities concerned should pass a By-law indicating they will participate in the Unit Organization. This will be done under the following Section of the appropriate Act:

    (i) Section No.254 - Municipal District Act.

    (ii) Section No.279 - Town and Village Act.

  (c) That Municipalities wishing to participate in Unit development will appoint a permanent representative or representatives to the Unit Control Committee.

  (d) To outline the basic principle that will apply for the financing of the Civil Defence Unit (This may be established on a per capita basis).

  (e) Other items as required.

4. After the initial joint organizational meeting the representatives should return to their respective councils to secure ratification and

. . . . . . /3

implementation of the resolutions with which they have agreed. In the event that a Council does not agree with any resolution so presented, the resolution should be modified to the satisfaction of all Municipalities concerned at a future Unit Control Committee meeting.

5. Unit Control Committee. The Unit Control Committee should appoint a Chairman and this appointment should be confirmed by resolution by all Councils. They should resolve any difficulties arising out of resolutions made at the initial organizational meeting. The functions of the Unit Control Committee include the following:

a. The appointment of a Unit Director of Civil Defence. This appointment should be confirmed by resolution of each Council participating in the Unit Organization.

b. The appointment of the Unit Deputy Director of Civil Defence.

c. On the recommendation of the Unit Director, the appointment of:

(1) Key Civil Defence personnel.

(2) A Unit Planning Committee.

d. The initiation of policy concerning Civil Defence development within the Unit Organization. (Should have the concurrence of the Municipal Councils).

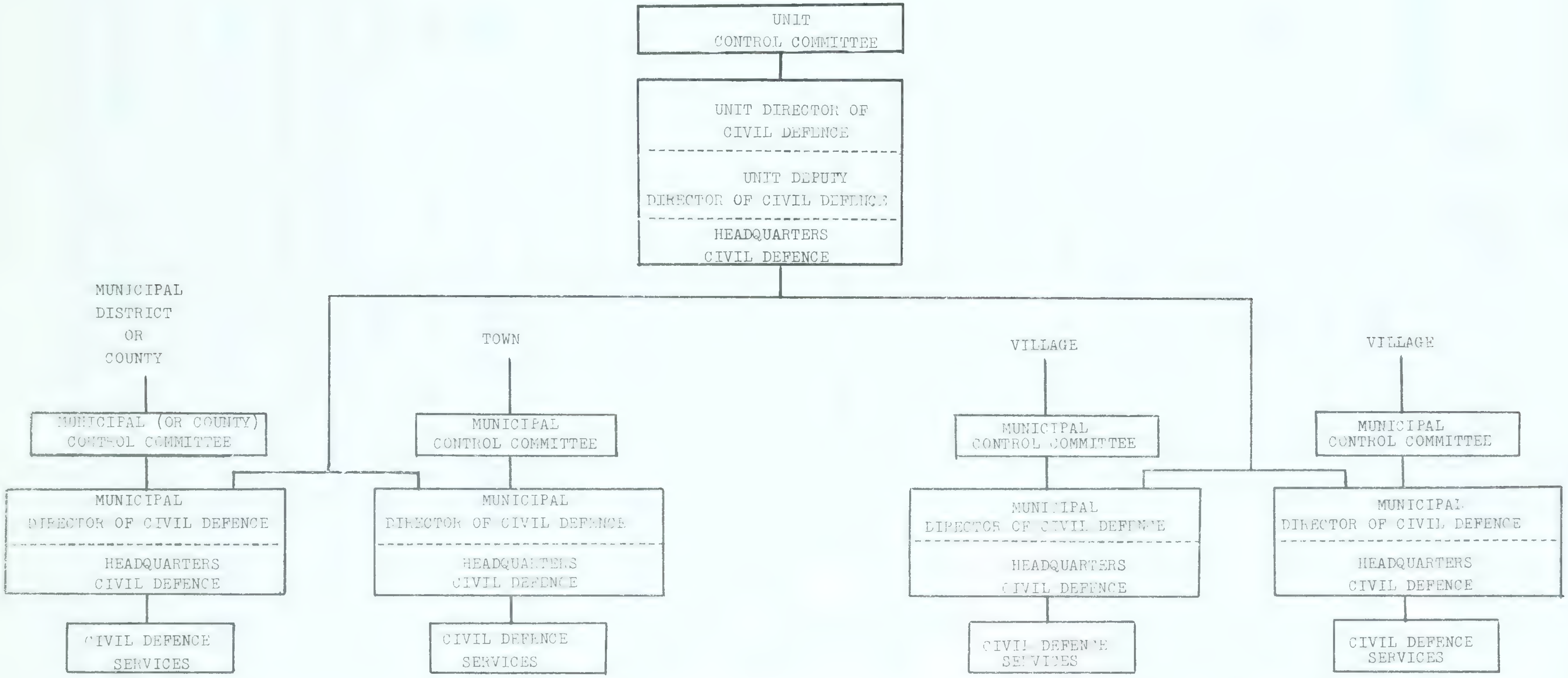
e. The approval of plans either in original or amended form for Civil Defence development within the Unit Organization. (To be forwarded to the Municipal Councils for final approval).

CONCLUSION

6. Each Municipality will develop its own Municipal Organization and Municipal Directors will work under the direction of the Unit Civil Defence Director. A Civil Defence Unit Chart is attached.

Attachment IV to
APPENDIX 2

CIVIL DEFENCE UNIT CHART


UNIT CONTROL COMMITTEE
UNIT DIRECTOR OF CIVIL DEFENCE
UNIT DEPUTY DIRECTOR OF CIVIL DEFENCE
HEADQUARTERS CIVIL DEFENCE
MUNICIPAL DISTRICT OR COUNTY
MUNICIPAL (OR COUNTY) CONTROL COMMITTEE
MUNICIPAL DIRECTOR OF CIVIL DEFENCE
HEADQUARTERS CIVIL DEFENCE
CIVIL DEFENCE SERVICES
TOWN
MUNICIPAL CONTROL COMMITTEE
MUNICIPAL DIRECTOR OF CIVIL DEFENCE
HEADQUARTERS CIVIL DEFENCE
CIVIL DEFENCE SERVICES
VILLAGE
MUNICIPAL CONTROL COMMITTEE
MUNICIPAL DIRECTOR OF CIVIL DEFENCE
HEADQUARTERS CIVIL DEFENCE
CIVIL DEFENCE SERVICES
VILLAGE
MUNICIPAL CONTROL COMMITTEE
MUNICIPAL DIRECTOR OF CIVIL DEFENCE
HEADQUARTERS CIVIL DEFENCE
CIVIL DEFENCE SERVICES

* A Civil Defence Unit is a Joint Civil Defence Organization of a Municipal District (or County) together with all the Towns and Villages within its boundaries.

ANNEX D to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

CASUALTIES FROM NUCLEAR WEAPONS

INTRODUCTION

F.C. Pace, M.D., Medical Consultant, Special Weapons Section, Emergency Health Services, Department of National Health and Welfare, Ottawa, has produced a pamphlet called "Casualties from Nuclear Weapons - A Review" for Emergency Health Services. The contents of this pamphlet, as published by Information Services Division, Department of National Health and Welfare, under the authority of the Minister, the Honourable J. Waldo Monteith, 1960, is reproduced hereunder.

1. "For the purpose of this article, a nuclear weapon is defined as a projectable device which converts nuclear energy into three forms - blast energy, heat and immediate radiation - and which also, under some conditions, distributes radioactive material over greater or less areas of countryside, as radioactive fallout. No distinction need be made between the terms atomic weapon and thermo-nuclear (or hydrogen) weapon, except that the letter yield more energy.

2. "It is well known but worth repeating that nuclear weapons differ from ordinary high explosive projectiles in only two particulars - they are much more powerful and they produce radioactive energy as well as blast and heat. It is well known, too, but perhaps not so commonly realized, that the immediate target and casualty effects of these weapons are due mainly to blast and heat and the radiation injury is, now, important only in relation to the delayed effects of fallout. Much of this paper will be given to a discussion of the effects of radiation from the fallout but it is necessary for a proper understanding of this particular aspect to review some

....../2.

of the general characteristics of these weapons.

3. "Energy Yields of Nuclear Weapons. Two special units are used to measure and describe the force of energy of atomic explosion. They are the KILOTON (KT), equal to the explosive energy of one thousand (1000) tons of high explosive; and the MEGATON (MT) equal to that of one million (1,000,000) tons. The first weapons used against Japan were of about 20 KT energy yield. Since then, a wide range has been developed, from one or two kilotons to several or many megatons. The low-yield weapons are probably designed for military use; those in the high kiloton and megaton ranges are for use against strategic targets, that is cities.

4. "Effects of Blast. The explosion produces a shock-wave in the air which, moving with great force and at about the speed of sound, damages or destroys buildings in the target area. Flying and falling debris is the direct cause of the traumatic injuries which are of the types to be expected - crush-injuries, fractures, bruises, lacerations and cuts from flying glass. At Hiroshima and Nagasaki about half the surviving casualties were of these types.

5. "The blast and other effects are measured from that point on the ground immediately under the centre of the explosion, called ground-zero (GZ). The degree of physical (structural) damage is, of course, greater near this point and less at a distance. For convenience, damage is described as follows: A-class means complete demolition of structure; B-class, damage so severe that buildings cannot be repaired but must be torn down; C, damage to a degree sufficient to render buildings unusable until repaired; D, appreciable damage but not enough to make the buildings unusable. For casualties, there will be many more deaths than injured within the A-ring and many injured survivors but fewer deaths between the C and D rings. That is, the number and proportion of survivors

/3

needing care for traumatic injuries will increase in rough proportion with distance from ground-zero.

6. "The following table, if regarded as a guide only, is a useful description of the extent of blast damage to be expected from weapons of various yields.

TABLE I

BLAST DAMAGE

YIELD	Radius (miles) from GZ of				Damage Area Within D-ring
	A-ring	B-ring	C-ring	D-ring	
1 KT	0.2 mi.	0.4 mi.	0.6 mi.	0.8 mi.	2 sq.mi.
20 KT	0.5 mi.	1.0 mi.	1.5 mi.	2.0 mi.	12 sq.mi.
100 KT	0.85 mi	1.7 mi.	2.5 mi.	3.4 mi.	36 sq.mi.
1 MT	1.8 mi.	3.7 mi.	5.5 mi.	7.4 mi.	170 sq.mi.
5 MT	3.0 mi.	6.0 mi.	9.0 mi.	12.0 mi.	450 sq.mi.
10 MT	4.0 mi.	8.0 mi.	12.0 mi.	16.0 mi.	750 sq.mi.

7. "Light damage will extend much further than the D-ring in many cases, It is unlikely that buildings with intact windows, will be encountered closer than 25 miles to GZ, and if, for planning purposes, intact weather-proof buildings are needed, they should be selected at least as far as this from presumed GZ.

8. "Effects of Heat. The most typical heat-effect of atomic weapons is flash heat - that is, a wave of heat given off at the instant of explosion and for a short time afterwards. (The fires caused by the circumstances of the explosion are another source of heat-injury but this aspect will not be discussed here). The distance to which these intensities are delivered are set out in the following table.

TABLE II

PROBABLE RANGES (IN MILES) AT WHICH FLASH-HEAT PRODUCES BURNS ON SKIN

YIELD OF WEAPON	Superficial Burn		Deep Burn	
	Air Burst	Surface Burst	Air Burst	Surface Burst
20 KT	2.5	1.5	1.5	0.9
100 KT	4.6	2.8	2.8	1.7
1 MT	13.0	7.8	8.0	4.8
5 MT	25.0	15.0	16.0	9.6
10 MT	34.0	19.2	21.0	12.6

In built-up areas shielding effects of buildings will reduce the distances given.

9. "This table is not accurate for all conditions of atmosphere, height of burst etc., that govern the distance at which heat-flash is dangerous. However, it supplies a reasonably good picture of what can occur with these weapons. If opaque material is interposed between the heat-source and the person, the burning effect is reduced or nullified. Clothing gives much protection, particularly if it is light in colour and loose fitting. White reflects much of the heat, and among the Japanese some very bizarre burn-patterns appeared on those who were wearing multi-coloured patterned clothes, the dark parts absorbing and transmitting the heat to the skin, the light protecting it. On the other hand the heat-flash in some cases set clothing alight and serious flame burns were produced.

10. "Associated with the heat-flash is a blinding flash of light. Its brilliance is said to be "equal to that of several suns". Its effect is to cause temporary loss of vision due to exhaustion of the visual purple of the retina. Like the effect of flash-heat, this can be prevented and will not occur if a person is not looking toward the explosion or is in shadow.

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11. "Effects of Immediate Radiations. The immediate radiations arise from the detonating event and from the incandescent "ball of fire" which appears immediately afterwards. These radiations possess the following important characteristics: They are of short duration (about one minute or less), they are highly penetrating and they cause the injury known as acute radiation sickness when absorbed in appreciable quantity. The probable effects of this and other doses are set out in Table III.

TABLE III

PROBABLE RANGES AND EFFECTS OF COMBINED FLASH NEUTRON AND GAMMA RADIATION

YIELD OF WEAPON	Distance (Miles) to which Various Roentgen Equivalent Exposures (REM UNITS) are Delivered		
	100 Units	400 Units	1000 Units
20 KT	1.0	0.7	0.6
100 KT	1.3	1.0	0.9
1 MT	1.8	1.6	1.4
5 MT	2.3	1.9	1.7
10 MT	2.6	2.2	1.9
PROBABLE EFFECTS	Mild disability within one or two days	Disability within hours; many deaths within weeks	Severe disability within hours; all dead within days

Note 1 : The effects are for flash nuclear radiation. Damaging blast and thermal effects extend beyond significant flash-radiation, especially in the cases of high-yield (MT) weapons.

Note 2 : Probable effects stated are subject to wide variations.

12. "It should be realized that the effects stated are probable early effects. However, in a military or Civil Defence situation we are chiefly concerned with ability to remain at work for the emergency period, that is "operational efficiency" and less with long-term health hazards. All doses stated are undesirably high from the viewpoint of health.

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13. "Comparing the distances to which blast and heat damage can reach, it is obvious that the more powerful the weapon the less extensive (relatively) is the range of the immediate radiations. And, because it is probable that weapons in the megaton range will be used against our cities, it is reasonable to assume that after attack most of the surviving casualties will suffer from ordinary injuries and burns; few if any of those getting appreciable doses of immediate radiation will survive blast and heat because they will be within the A-ring and will be killed by multiple causes.

14. "These notions, of course, are not correct if "small" weapons are used. For example, the yields of the atomic bombs dropped at Hiroshima and Nagasaki in 1945 were about 20 KT - one five-hundredth to one one-thousandth of the power of some present day weapons - and in these two instances 10 to 15% of surviving casualties presented as their principal disability acute radiation sickness.

15. "Effects of Radioactive Fallout. It remains to consider the injuries caused by the radioactive fallout. Fallout develops thus:-

a. When a nuclear weapon explodes one of the most striking phenomena is the formation of a "ball of fire". The fireball from the 20 KT Hiroshima weapon was about 700 feet in diameter; that of a megaton weapon may measure three miles.

b. If the weapon bursts high in the air the fireball rises and expands and is soon dissipated by the winds, so that the radioactive material of which it is composed is dispersed and, for practical purposes, there is no fallout. If however, the burst is low so that the fireball touches the ground, the energy of the explosion causes cratering and pulverization of the ground-material and the heat vapourizes it

and extent can be forecast with fair probability.

18. "From this widely distributed radioactive fallout two types of emanation are given off. The one is gamma radiation (also an important constituent of the immediate hazard) which is highly penetrating and which causes acute radiation sickness. The other type is much less penetrating; it is composed of "soft" rays (beta particles) and its main effect is to cause damage to the body-surface, that is, skin-burns. Further, if radioactive material is inhaled or ingested it is capable of producing serious effects; this danger is called the internal hazard to indicate that the source of the radiation lies within the organism and to distinguish it from the other hazard - the external hazard - already noted.

19. "The fallout, then, presents three radiation hazards:

a. The EXTERNAL hazard, due to gamma rays, causing radiation sickness

b. The CONTACT hazard, from beta rays, causing skin-damage ("burns").

c. The INTERNAL hazard, from food and drink contaminated by the fallout.

20. "Their relative importance and their times of appearance are in the same order as above. Severe radiation sickness appears within hours or days and is disabling or lethal. Skin damage develops within days or weeks and is a nuisance. Effects from radioactive material lodged in the body may not appear for years; while serious, these effects will not hamper survival operations though such operations must include plans for their prevention.

21. "The gamma activity of the fallout decreases rather quickly with time. At seven hours after the explosion it is one-tenth of what it was at one hour; at two days, one one-hundredth and at two weeks, one-thousandth. The gamma activity is commonly measured by an instrument called a survey-meter. It records "dose rate", that is,

roentgens per hour. If the reading on such a meter were 1000 roentgens per hour at one hour, then at seven hours it would be 100, at the end of two days, 10 and so on. These instruments and others are essential in controlling radiation exposures. In the Armed Services and Civil Defence they are handled by specially trained persons (radiation monitors) who are able to read the instruments and to interpret the results.*

22. "The beta activity of the fallout is difficult to estimate satisfactorily and none of the radiation-detection instruments developed for field-use can record it accurately. Therefore, when we come to consider the quantities of radiation to which people are exposed and the effects of different levels of exposure, we limit ourselves to estimating the penetrating rays - that is, gamma radiation.

23. "There is a definite association between the quantity of radiation to which an individual is exposed and the clinical reactions which follow. In military and civil defence operations, the most significant exposures are from external sources. The most important contributor to both is the penetrating gamma rays. Moreover, the whole body is exposed and not a limited part, and it is likely that the dose would be inflicted within a short space of time (one or two minutes to one or two days) in most cases.

24. "Radiation sickness can be recognized and treated only by professional members of Civil Defence Health Services. Any

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*The radiation-detection instruments ("radiac" instruments) which are most useful are three - radiation survey meters, contamination meters and dose-meters or dosimeters. Survey meters and contamination meters work on electronic principles. They are portable and are provided with needle-dials which read in roentgens or milliroentgens per hour. A roentgen is simply a quantity of radiation. -Knowing the time that has elapsed since the explosion, it is possible to calculate from the dial reading the dose delivered before or after the time of reading, over any period of time.
Dosimeters work on several principles. They are small instruments designed to be worn like a pencil or a badge. They record total dose, not dose rate as in the cases of the other two.

persons complaining of illness after exposure to radiation must be referred to a medical installation.

25. "Prevention of Radiation Injuries. The only satisfactory method of controlling injury, both by highly-penetrating and less penetrating rays, is prevention. One of the principal aims of evacuation planning is to move populations into areas where meteorological prediction indicates that fallout is least likely to occur. These areas, we have seen, are "upwind" to target-cities, that is, usually to the west in North America. If fallout occurs in an occupied area, complete protection against skin-burns can be attained by simply going indoors; the less-penetrating rays are easily stopped by the roofs and walls of houses.

26. "The highly penetrating gamma rays are, of course, less easily shielded off. Inside an ordinary house the dose-rate is about half that in the open; in an ordinary basement, one-tenth. In a deep shelter with earth head-cover two or three feet in thickness the dose-rate is reduced to insignificant levels. A deep basement prepared for occupancy, with food, water and sanitary facilities, is termed a refuge. For planning purposes it is assumed that such refuges will have to be occupied for about two days while the activity of heavy fallout is falling off sufficiently to allow reasonably-safe crossing of contaminated areas.

27. "The Contact Hazard. If contamination of the person occurs, cleansing is required. The ideal method is to remove all clothing to shower and wash with copious supplies of water, detergent and soft wash-cloths. In washing, particular attention must be paid to hair, nails and body-folds. However, it is not likely that the circumstances of mass disaster will permit any elaborate procedures and most contaminated persons can reduce the hazard quite satisfactorily by dusting outer clothing (including ordinary shoes, which collect dust), washing scalp, face, neck and hands

with water and ordinary detergent and replacing outer clothing. The heavy contamination on the discarded clothing, if dry, can be reduced by brushing; all such clothing should be put aside under circumstances of safety until natural radioactive decay has reduced the hazard to acceptable levels. At the present time Emergency Health Services are developing simple drills for decontamination; meanwhile the governing principles are stated.

28. "A special point worth noting is the recommended use of detergent, not soap. Soap can form sticky and insoluble compounds with some of the fallout elements and some authorities believe that rinsing with plain water is a better procedure than washing with soap.

29. "A further point is that women should take care to cover the hair if fallout is threatening. A head-cover like an operating room cap or some such improvisation, would serve well enough and would abolish the need for prolonged washing.

30. Those who deal with contaminated casualties must take certain steps to protect themselves from secondary contamination and must work closely with radiation monitors. Attendants should wear gloves of material which can be washed readily or discarded; a dosimeter must be worn and read at suitable intervals, to control exposure to penetrating rays; personal cleansing at the end of a tour of duty is essential. It is doubtful if special clothing will be provided; indeed, it is probably not necessary, but changes of clothing must be available to medical, nursing and other personnel who deal with casualties of this kind.

31. "While detailed plans have not been worked out, a few words should be said in regard to the principles which will govern management of contaminated patients. Contamination is suspected where people are rescued from a fallout area. Clothing should be

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removed and the body surface gently-washed with detergent suds.

32. "Many texts speak of "vigorous repeated scrubbing" with brushes. This is undesirable because any but gentle cleansing methods may drive the radioactive poisons through the skin, and, for the same reason repeated cleansing is contra-indicated. If any contamination is thought to remain after two washings, it is best to leave it on the surface rather than to risk driving it in.

33. "The Internal Radiation Hazard. Inhalation of material from fallout is unlikely to be a serious matter. Except under very special circumstances, ingestion of contaminated food and water will probably be the chief cause of radioactive poisoning. Once radioactive poisons have gained access to the body they are hard to remove - particularly radioactive strontium which is the most dangerous in this repsect. Therefore, treatment again is mainly preventive. The first requirement is to determine whether or not food and drink are contaminated to any serious degree. This is accomplished by radiation-monitoring. If contamination is present, the best method, particularly with water, is to seek an alternate source. However, low degrees of contamination are not dangerous over limited periods, and so acceptable levels have been set as guides for health authorities. Water from covered sources - deep wells, artesian wells, domestic tanks or covered cisterns - if not contaminated in transit, would be radiologically safe in emergency.

34. "For food, the best method is simply to keep the dirt off. Tinned food is safe, since the containers can be washed before opening, and tinned milk is desirable for infant feeding. Animals exposed to fall-out are safe, if they are not suffering from radiation-injury, if special care is taken in butchering and if the muscle (i.e. red meat) only is eaten. It is obvious that management of food and water after nuclear attack is a major health problem and a proper subject for special study. Animal food safety is the responsibility of Emergency

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Health Services, and all cases of doubt must be referred to them. The veterinary component of Emergency Health Services would normally give advice of this matter.

SUMMARY

35. "Weapons now exist in a pretty wide range of yields, from 1 or 2 kilotons' energy to several or many megatons'. The products of any atomic explosion are four: blast-energy, heat-flash, including a dazzling light-flash, immediate radiation and residual radiation as a widely-distributed dust. High-yield weapons are those most likely to be used against North American cities, and, for planning purposes, the yield is taken at 5 MT. With weapons in these higher energy ranges, the extent of the immediate radiation is much less than those of blast and heat. Therefore, persons receiving damaging doses of immediate radiation will likely be dead of several causes and most of the surviving casualties will present traumatic or thermal lesions.

36. The radioactive fallout occurs when the weapon is burst close to the ground: No fallout of significance to civil defence nor to the military occurs with a high aerial burst. Fallout from a single high yield weapon may contaminate hundreds of square miles of territory."

OP. CIT.

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ACKNOWLEDGEMENT

The tables were prepared by Dr.E.E. Massey, Defence Research Board. Dr. Massey gave other valuable assistance in revision."

REFERENCE BIBLIOGRAPHY

The attention of planning officers interested in further information on Nuclear Radiation is invited to the following books on the subject.

a. The Effects of Nuclear Weapons - by United States Atomic Energy Commission, June 1957.

b. Precis available from Province of Alberta Civil Defence School used on Radiation Monitoring Course.

ANNEX E to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

RADIATION HAZARD INFORMATION

1. During survival operations, radioactivity may affect the health of the general public, their ability to move from one area to another, the amount of time they can remain outside fallout shelter, the food they eat and the water they drink. In addition, those people whose duties require them to move in and out of radioactive areas, together with equipment and vehicles will all be exposed to contamination. It is therefore necessary to provide some guidance with regard to dealing with the various hazards to which individuals may be exposed.

2. Information on several aspects of the radiation hazard is presented in the Appendices to this Annex, as follows:

   a. Appendices 1 to 7 comprise material which has been prepared by the Interdepartmental Radiological Defence Working Group established by the Federal Government. The purpose of this group is to examine the available scientific and statistical data on radiation, and translate the desirable safety and precautionary measures into operational methods and procedures which can be readily adopted and applied during survival operations.

   b. Appendix 8 has been compiled by Alberta EMO and is based on authoritative current material.

3. As subjects are reviewed, Appendices will be amended as necessary, and new information will be added to this Annex as required.

APPENDICES

APPENDIX 1 - Protection Factors of Buildings against Radiation from Fallout

2 - Contamination of Drinking Water by Radioactive Fallout from Nuclear Weapons: Rules for Survey and Management

3 - Contamination of Human Food Stocks by Radioactive Fallout from Nuclear Weapons: Rules for Survey and Management

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APPENDIX 4 - Rules and Standards for Maintaining Operational Efficiency in a Fallout Field

5 - Management of Vehicles Contaminated by Radioactive Fallout

6 - Protection by Clothing against Radioactive Fallout

7 - Definition of Areas of Serious Fallout

8 - Fallout Zones and Population Control

APPENDIX 1 to
ANNEX E to
Alberta Survival Plan
Volume Two
Dated: February 1961

PROTECTION FACTOR OF BUILDINGS AGAINST RADIATION FROM FALLOUT

OBJECT

1. The purpose of this Appendix is to provide guidance in the degree of protection afforded by buildings against fallout radiation.

DEFINITION

2. The protection factor of a building is the factor by which the out-of-doors radiation dose-rate is reduced by the building. For example, a building with a protection factor of 5 would reduce an outside dose-rate of 100 roentgens per hour to one of 20 roentgens per hour.

DISCUSSION

3. The attached table (Attachment I) gives the approximate protection factors for most types of present day construction. For more massive types of construction the protection factors would be higher.

4. For basements in homes the floor of the basement is taken to be 4' 6" below ground level. If this depth is greater the factor will be higher, and vice versa.

5. For the reinforced concrete buildings "lower floors" means all floors below the top one or two, and the basement is assumed to be completely below ground level.

6. For shelters below ground surface the point of weakness is the entrance. Inadequately protected entrances may reduce the protection factor appreciably.

7. The presence of adjoining buildings will increase the protection factor.

Attachment I - Building Protection Factors (Estimated).

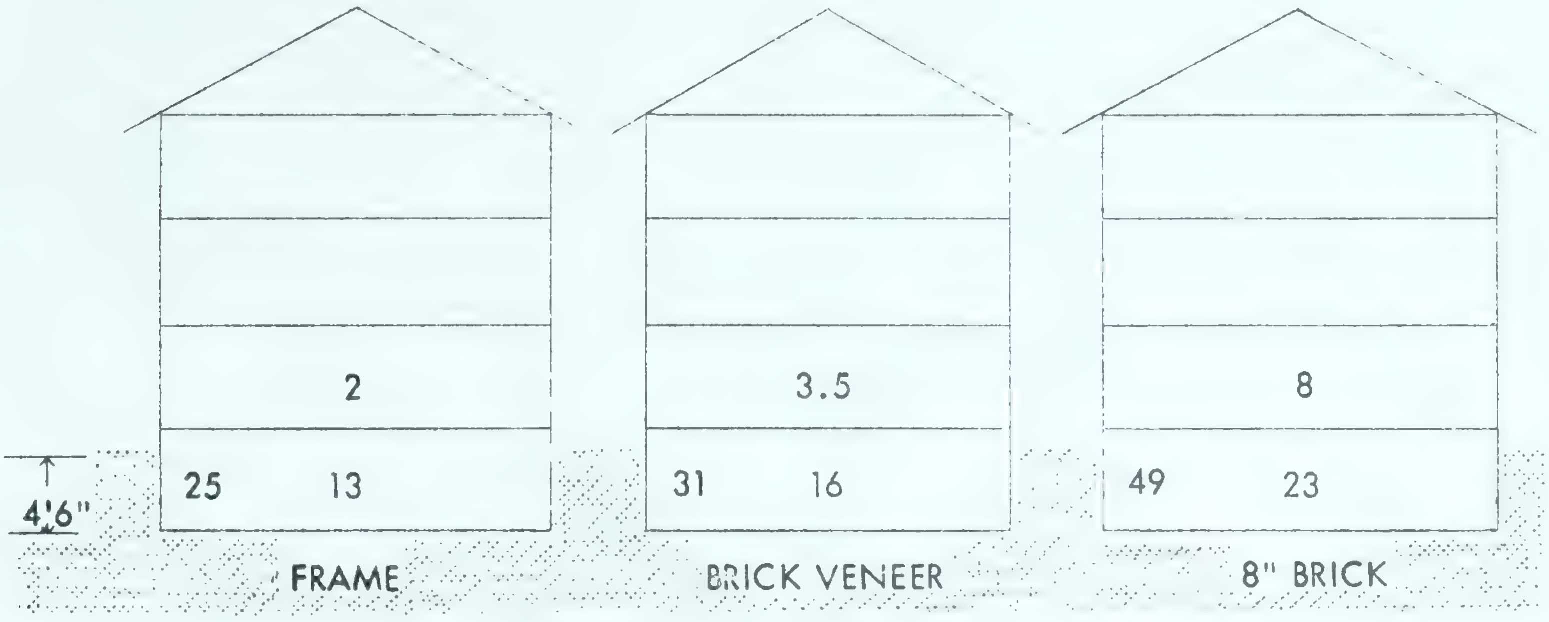
ATTACHMENT I to
Appendix 1 to
Annex E to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

BUILDING PROTECTION FACTORS (ESTIMATED)

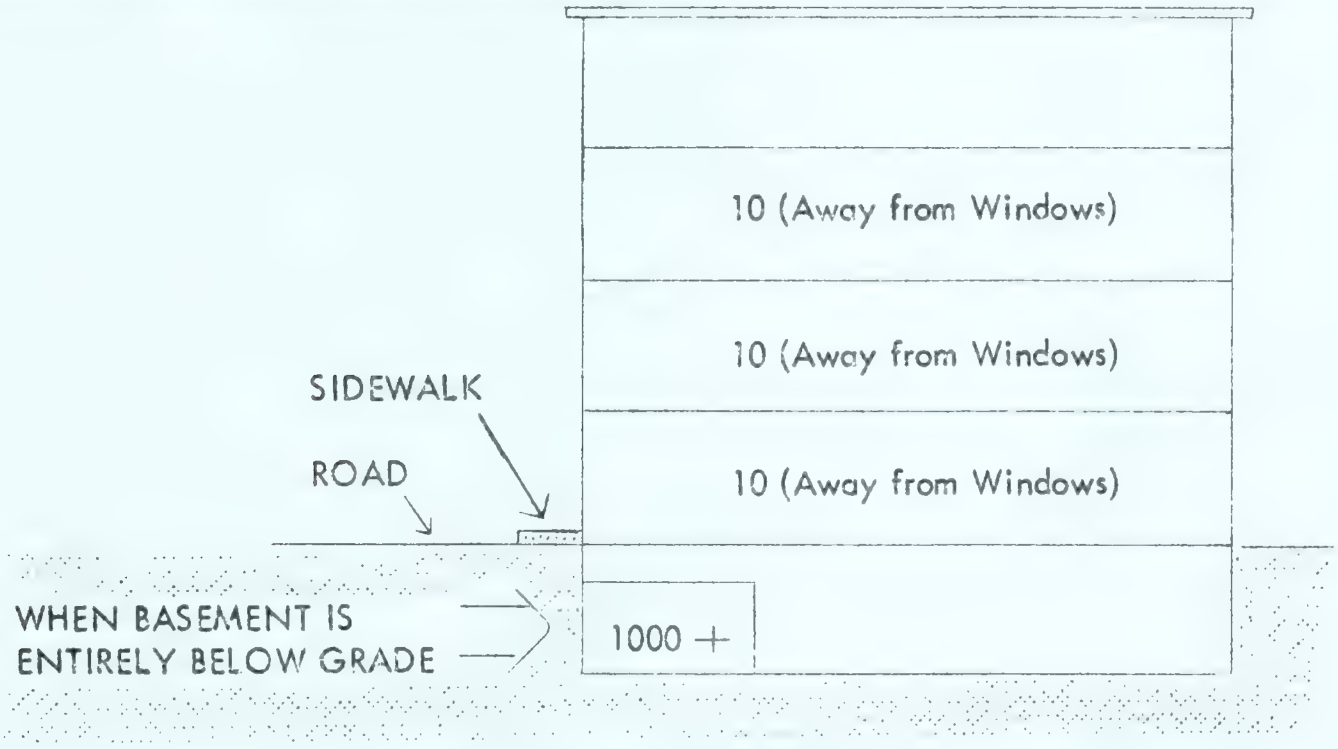
STRUCTURAL TYPE	PROTECTION FACTORS		
	Frame	Brick Veneer	8" Brick
Central Mortgage and Housing 3 Bedroom Houses			
2 Storey:			
Ground floor centre	2	3 (plus)	7
Basement centre	10	16	23
Basement corner	15	25	41
1 1/2 Storey:			
Ground floor centre	2	3 (plus)	8
Basement centre	8	12	17
Basement corner	15	20	26
1 Storey:			
Ground floor centre	2–	3–	5
Basement centre	7	8	9
Basement corner	11	12	13
3 Storey Apt. Block (6 Units):			
Ground floor	2	3.5	8
Basement centre	13	16	23
Basement corner	25	31	49
Multi-storey reinforced concrete:			
Lower floors	10 (away from windows)		
Basement (entirely below ground surface)	1000 or more		
Shelter below ground surface (3 ft. of earth cover)	1000 or more		

NOTE: Diagrams showing the above protection factors are attached.

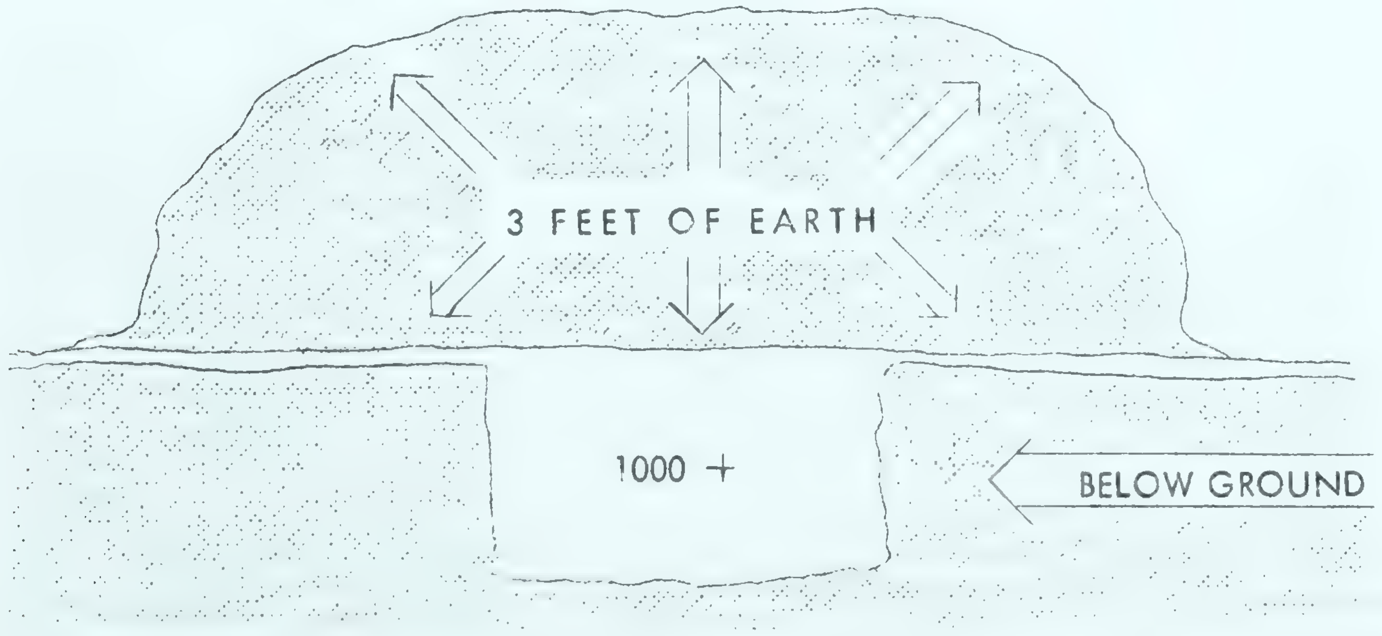
BUILDING PROTECTION FACTORS (ESTIMATED)



3 STOREY APT. - 6 UNITS

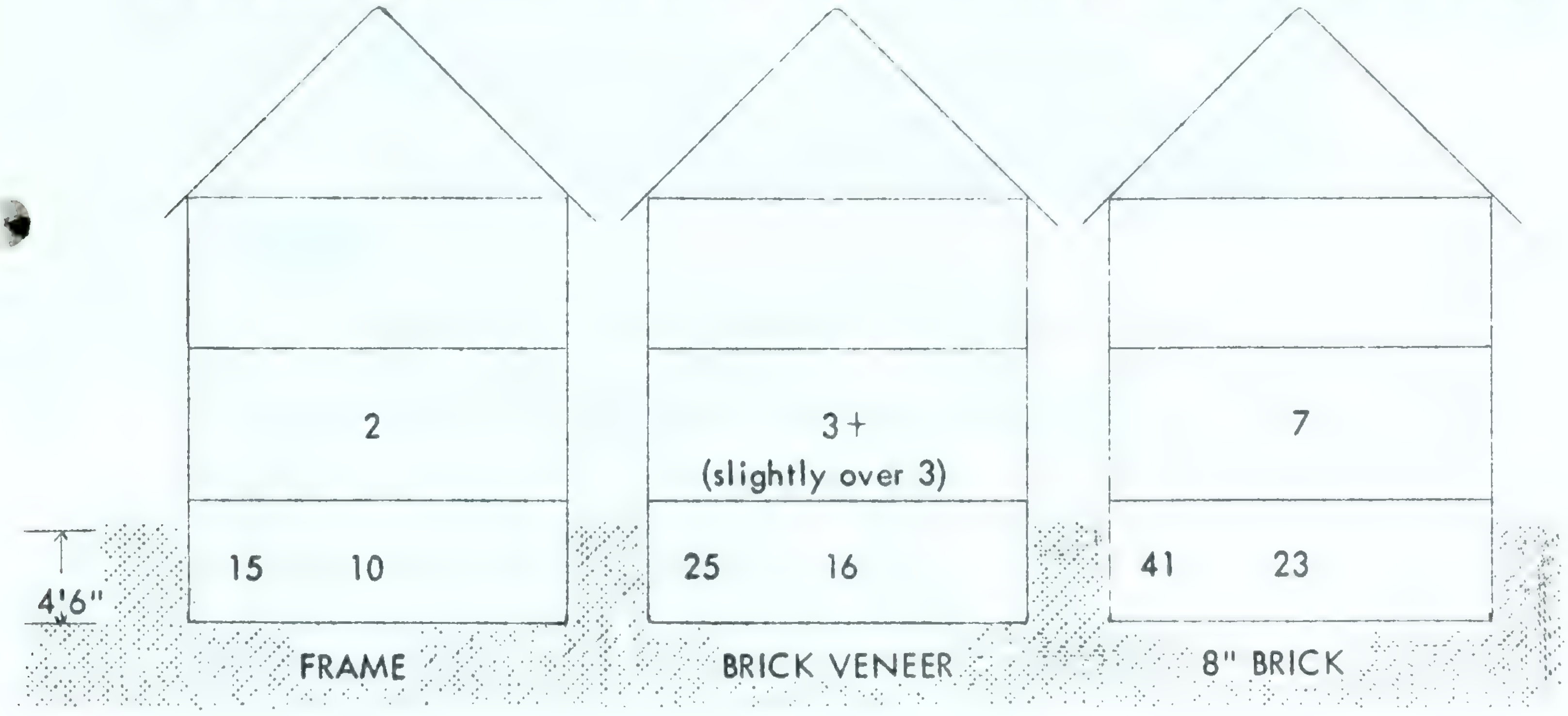


MULTI-STOREY



SHELTER BELOW GROUND

BUILDING PROTECTION FACTORS (ESTIMATED)



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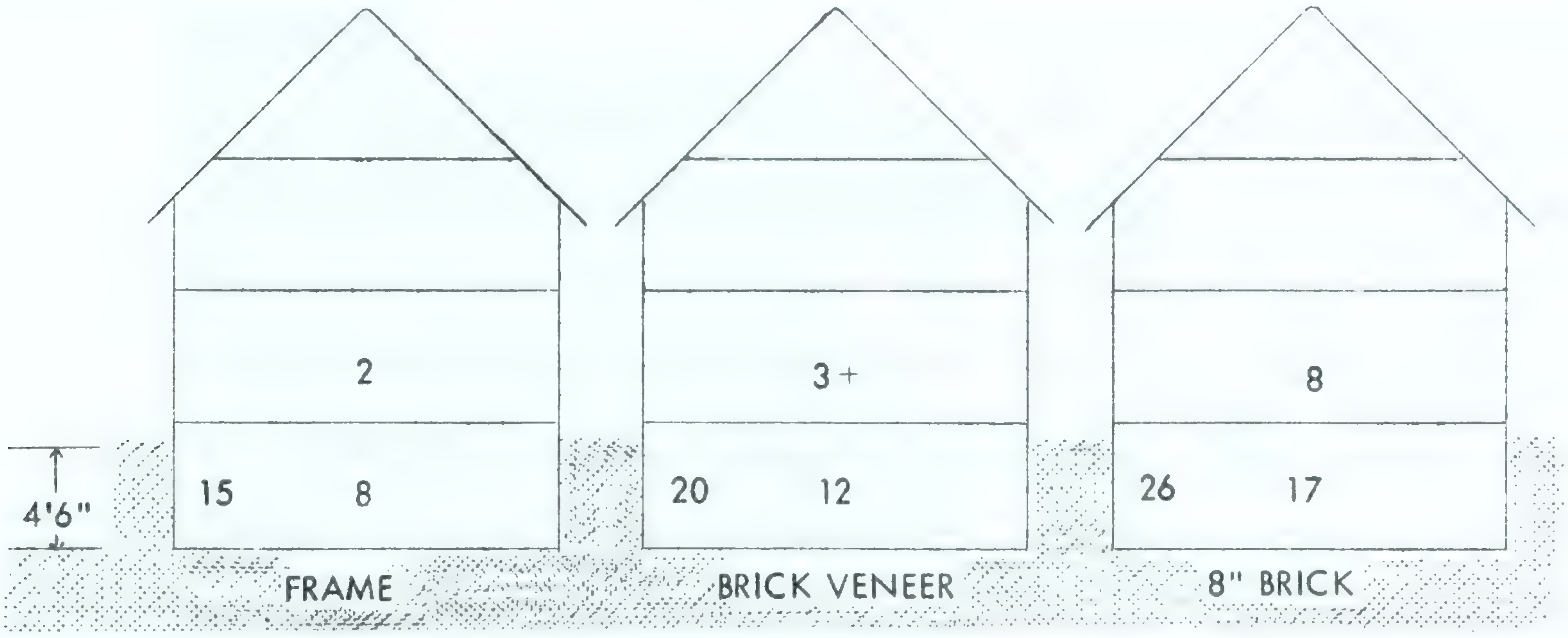

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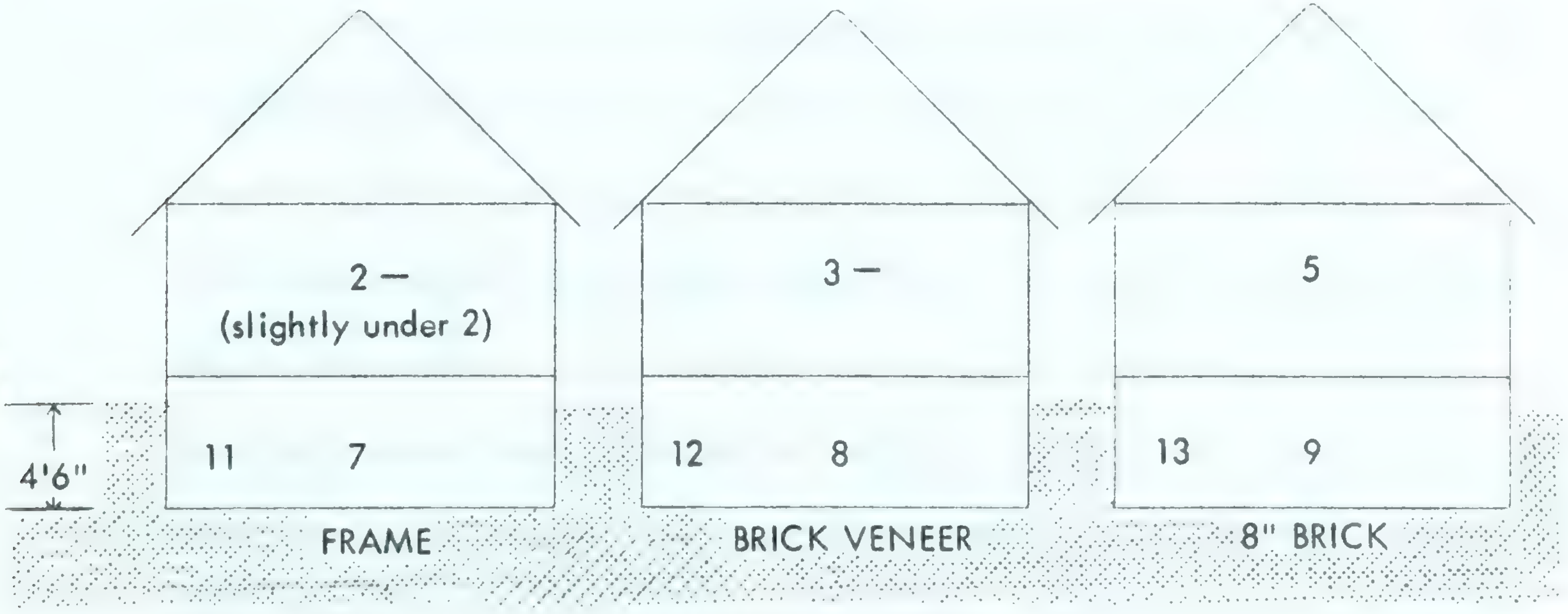

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APPENDIX 2 to
ANNEX E to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

CONTAMINATION OF DRINKING WATER BY RADIOACTIVE FALLOUT FROM NUCLEAR WEAPONS: RULES FOR SURVEY AND MANAGEMENT

OBJECT

1. The object of this Appendix is to provide guidance on the survey management and treatment of drinking water subject to contamination by radioactive fallout from nuclear weapons, and indicate within which limits it would be safe for human consumption.

APPLICABILITY

2. The readings described herein must be taken within a period of ten days after the contaminating detonation.

GENERAL

3. The radioactive fallout from nuclear weapons could contaminate open water supplies within the fallout area, to degrees sufficient to present grave ingestion hazards. Processes such as radioactive decay, settling, filtration and dilution would tend to reduce the danger, nevertheless, both in the early days after the attacks and later, one must know whether or not drinking water supplies are radiologically safe. All water drawn from open sources --- lakes, rivers, watersheds, reservoirs, uncovered wells --- located where fallout has occurred are subject to contamination.

THEORY

4. Problems of water-contamination by fallout are rather complex because fission products are a host of different nuclear species mixed together. It is not enough to measure the radioactivity, beacuse very little relationship exists between the actual toxicity of the material and the radioactivity as measured by instruments. Such factors as uptake, metabolic behaviour, radioactive decay and retention by the (human) organism are also important. Materials that show the same radioactivity may differ a millionfold or more in toxicity. Only two or three of the hundred or more nuclear species that can be present in fallout are of

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importance in assessing toxicity. They are vastly more poisonous than the rest put together but they account for only a small proportion of the radioactivity found. Measurement of the radioactivity in water contaminated by the mixed fission products constituting the fallout is, therefore, not a measurement of toxicity.

5. By the methods considered here, concentrations of the more toxic elements of the fallout (chiefly radioactive forms of strontium, barium and lanthanum) are estimated in terms of the gamma activity emitted by the mixed fission products.

6. The technique described is generally applicable whether or not water-treatment has been undertaken. In cases where water has been treated by ordinary methods more than 3 days after contamination, one additional day should elapse before checking the contamination (for reasons of physics which need not be discussed here). The values stated (TABLE I) are valid for any fresh fallout. They denote limits of radioactivity where the water is consumed throughout a period of 10 days. If the period of consumption must be extended to 30 days, the values set out in the Table should be halved.

7. The simple method of radiation monitoring has been developed for use only within the first 10 days after detonation of the weapon. After 10 days, the techniques of radio-chemical analysis must be applied. The latter methods alone are reliable for any fallout which is older than 10 days; also it is the only reliable method when mixed fallouts from two or more weapons detonated at periods more than 10 days apart are to be evaluated. For the present purposes, then, fresh fission products are regarded as those from a weapon detonated 10 days or less before radiation monitoring, and old fission products are those surveyed at times after 10 days.

METHOD

8. The survey is conducted by a trained radiation monitor. A radioactive survey meter capable of reading in the range of 1 to 100 milliroentgen per hour, is used. If the instrument possesses a beta window it should be kept closed. Over an open water source (e.g. lake, reservoir) the instrument

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(or probe) is held about 4 inches above water surface. TABLE I gives more detailed directions.

DOMESTIC WATER

9. There is no suitable method of testing domestic water supplies within the house, therefore stocks of water should be maintained in protected containers, such as covered water tanks or baths, sealed jars and bottles and even electric water heaters.

TABLE I

Gamma Field Measurements for Maximum Permissable
Water Contamination
(fresh nuclear fallout)

Water Body	Time since Weapon Detonation			
	12 hrs.	1 day	2 days	10 days
a. Reservoir or lake, measured far from shore	100 mr/hr	50 mr/hr	25 mr/hr	12 mr/hr
b. Reservoir, pond, etc., measured at arms length from shore, close to surface and over water at least 2 ft. deep	50	25	12	6
c. Water tank, 150 to 1000 gallons, measured in contact with centre of one surface	50	25	12	6
d. Water can, 2 to 4 gallons, measured in contact with centre of one face	25	12	6	3

Note 1. Readings are not valid beyond 10 days post-detonation (see text above).

Note 2. Alternate water sources free of radio-contamination, must be identified and brought into use as soon as possible. This, in spite of any directions here given.

Note 3. In any areas where the gamma-intensity field is too high to permit short operations, the use of open water supplies is not recommended and further attempts at water survey are a waste of time.

Note 4. Standards can be greatly relaxed if the water is needed for washing radioactive contamination from unbroken skin surfaces. If personal decontamination is urgent in any area where operations are permissive, any water supplies can be used.

Note 5. Water conforming to the above figures may be consumed in addition to the consuming of food conforming to the provisions of Appendix 3 to this Annex, as the figures include a large safety factor.

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PURIFICATION OF WATER CONTAMINATED BY FALLOUT

10. For emergency use the purification of water supplies is relatively simple. Radiotoxic materials are fairly easily removed by many of the ordinary treatment techniques. Reservoirs with sandfilters and especially filters with any organic growth on them will remove some activity. Unfortunately, the most toxic of the mixed fission products, radio-strontium and radio-barium, are least affected by this method of filtration. Ordinary soil and clay are quite efficient in fixing the toxic products so that water which has passed through any depth of soil is usually safe. Ion-exchange columns in a water-softening unit will be relatively efficient in removing mixed fission products. In emergency it would be enough to stir up the muddy bottom of a reservoir or lake and then to allow it to settle. Alternately, dumping several truckloads of earth or clay into water would allow settling-out of the radioactive material to take place. For small quantities, experimental work indicates that even heavily-contaminated water can be made fit to drink by filtering through a layer of clay, charcoal and iron filings or steel wool; material in solution as well as that in suspension would be removed.

CONCLUSIONS

11. In all cases where the water has been treated by one of the above methods it should be re-surveyed by a radiation monitor before use.

12. In isolated cases, where thirst is dangerous and no facilities for monitoring are available, suspected water could be treated as indicated and drunk in quantities sufficient to maintain life. Though this is not recommended, it would be beyond common sense to let people become dangerously dehydrated for lack of a drink or two of water containing quantities of radio-toxins unacceptable under better circumstances.

13. It is emphasized that even under the best conditions of control, alternate clean sources also must be brought into use as soon as possible.

14. It should be particularly noted that prevention of contamination is even simpler, more time-saving and more effective than combined survey-purification methods. If one conceives of radioactive fallout simply as

dust possessed of a single peculiar property, it at once becomes evident that anything that prevents settling of the dirt into the water will ensure safe water. Underground sources, covered wells and water stored in tanks, tins and bottles, should give a sufficient potable supply for the emergency period and it is toward prevention rather than treatment that Civil Defence planning on water-supplies must be aimed.

Op.Cit. Tait G.W.C. and Merritt W.F.; Emergency Radiation Monitoring of Drinking Water. CRHP - 733 Atomic Energy of Canada Ltd., Chalk River. Oct 1957.

APPENDIX 3 to
ANNEX E to
Alberta Survival Plan
Volume Two
Dated: February 1961

CONTAMINATION OF HUMAN FOOD STOCKS BY RADIOACTIVE FALLOUT FROM NUCLEAR WEAPONS RULES FOR SURVEY AND MANAGEMENT

OBJECT

1. The object of this Appendix is to provide guidance on the survey and management of food stocks both bulk and domestically held subject to contamination by radioactive fallout from nuclear weapons and to indicate within which limits they would be safe for human consumption.

APPLICABILITY

2. The following limitations are imposed when using these instructions:

   a. Assumption is made that on a weight-for-weight basis, the acceptable values for water can be applied to food and any resultant discrepancy will be on the safe side.

   b. The contaminated food may be only consumed for a normal 10-day period which, however, may be extended to a maximum of 30 days consumption provided the measurements, necessarily made within 10 days after weapon detonation, do not exceed the limits set out in the table below.

   c. All foods which do not meet the values set out in the table must be subjected to Health Services direction (which may involve Radio-Chemical Analysis).

GENERAL

3. The acceptable amount of contamination per unit weight food is the same as that per unit weight water. A gallon of fresh water weighs about 10 pounds.

THEORY

4. The theory of emergency radiation monitoring of food is the same as that stated for drinking water supplies (Appendix 2 to this Annex) except that in the case of bulk food, the safety factor is greater.

5. Such a theory is considered acceptable because any error will be on the safe side. This follows because a given amount of contamination would render a higher survey reading if it were all present on the surface than

if it were uniformly distributed throughout the mass being monitored.

6. The values tabulated below are for any fresh fallout, i.e. fallout not more than 10 days old. They denote upward limits of radioactivity where the food is consumed throughout a period of 10 days; if the period of consumption must be extended to 30 days, the values set out in both tables must be halved. For fallout older than 10 days, the techniques of radio-chemical analysis must be applied.

METHOD

7. The survey is conducted by a trained monitor. A survey meter reading from 1 to 100 mr/hr is used. If the instrument possesses a beta window, it should be kept closed. The instrument is held in contact with the centre of an exterior face of a milk can or about four inches from a flat surface of the bulk food to be surveyed.

TABLE

Gamma Field Measurements for Maximum Permissable Food Contamination
(fresh nuclear fallout)

Capacity	Time since weapon detonation			
	12 hours	1 day	2 days	10 days
Bulk Foods				
1 - 5 tons	50 mr/hr	25	12	6
100 - 500 pounds	35	18	9	4
10 - 50 pounds	25	12	6	3
Milk				
150 - 1000 gallon tank	50 mr/hr	25	12	6
2 - 10 gallon can	25	12	6	3

Note 1. Readings are taken 4" from a flat surface of the bulk food stock and at the centre of an exterior face of a milk tank or can (see text above).

Note 2. The method is not valid beyond 10 days post-detonation.

Note 3. It is not valid for quantities less than 10 pounds weight. Lesser weights should be accumulated to 10 pounds or more in a single pile for survey.

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Note 4. Alternate food supplies free from contamination must be brought into use as soon as possible. This in spite of any directions here given.

Note 5. In any area where the gamma intensity is too high to permit short operations survey by this method is a waste of time. The food will be considered dangerous, suitably identified and placed in isolated storage until proven safe by radio-chemical analysis at later times.

Note 6. Food conforming to the above figures may be consumed in addition to the consuming of water conforming to the provisions shown in Appendix 2 to this Annex, as the figures include a large safety factor.

PROTECTION OF FOOD STOCKS AGAINST FALLOUT

8. In areas at risk from fallout, canned foods should be stockpiled as much as possible. If the exterior surfaces of the cans become contaminated, they should be cleansed in detergent suds and rinsed; then remonitored and opened. When opened, the readings on container surfaces should be at or below the values tabulated.

9. Meats and other fresh foodstuffs should be kept under dustproof conditions. Good buildings, meat and vegetable cellars or tarpaulins are satisfactory.

10. Meats contained in well-sealed plastic containers can be treated as for canned goods. Where the containers are not sealproof, the contents, like bulk meat contaminated by fallout, can be made safe by removing the outer layer and re-monitoring the remainder. On re-monitoring, the readings should be at or below the values tabulated.

11. Contaminated raw food supplies other than meat are not easily decontaminated and therefore should not be used except in extreme emergency.

12. Food contaminated or treated (meat) which cannot be rejected should be examined by radio-chemical analysis before release for use.

13. The slaughtering of animals and disposal of any contaminated food which exceeds the limits tabulated in the table above must not be undertaken without firm direction by health authorities.

14. Food contaminated to or less than the limits given in the table (page 2) can be consumed without further treatment. Food contaminated to degrees above these tabulated limits (including packaged foods that resist cleaning) will be set aside for professional management.

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OTHER FACTORS IN FOOD SAFETY

15. Fire and blast damage to protective packaging will make food unsafe. Interruption of refrigeration will be followed by spoilage; perishable food stocks in evacuated areas are a particular case. Wherever possible, the utilization of neighbouring facilities should be instituted.

16. In general, the disruption caused by nuclear attack will be followed by hygienic hazards to food stocks which will be at least as grave as those caused by the radioactive fallout.

SECONDARY CONTAMINATION

17. Foods removed from cover or container and food that has been contaminated must be kept free from secondary radioactive contamination from its surroundings and from the person of the handler.

APPENDIX 4 to
ANNEX E to
Alberta Survival Plan
Volume Two
Dated: February 1961

RULES AND STANDARDS FOR MAINTAINING OPERATIONAL EFFICIENCY IN A FALLOUT FIELD

OBJECT

1. The object of this Appendix is to provide guidance on the permissible levels of exposure to penetrating radiation for personnel who are required to work in areas made radioactive by fallout from nuclear weapons.

APPLICABILITY

2. The levels prescribed herein, should be applied to all civil defence operations in radioactive areas. They are very high levels and must not be exceeded without competent medical advice and a full knowledge of the risks involved.

RULES AND STANDARDS

3. A simplified and sufficiently accurate set of rules for this purpose has been developed and is now accepted by planners, technological advisors and medical practitioners. These rules follow:

   a. No one should be deliberately exposed to radiation without good reason.

   b. The levels of exposure must be kept as low as may be compatible with the success of a useful defensive operation.

   c. Responsibility for decision on the need for radiation exposure is that of the Civil Defence Co-ordinator (Director) or his local representative.

   d. Responsibility for measurement and calculation of radiation exposures belongs to the technologist (Radiation Monitoring Services).

   e. Responsibility for advice on probable effects of exposure is the province of the professional medical advisor.

4. Persons who are exposed to not more than:

   a. 200 r whole body radiation in a six weeks' exposure with a fairly even daily exposure rate; or

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b. 75 to 120 r whole body radiation in a week also with a fairly even daily exposure rate; or

c. 50 to 100 r whole body radiation in one day, may be expected to escape without noticeable loss of operational efficiency.

5. As exposure-levels increase, the probability of occurrence of operational inefficiency increases until at just above the upper limits of the ranges quoted in the above paragraph some mild reactions can be expected.

6. Where exposures greatly exceed 200 r for the emergency period, say 6 weeks more or less, those so exposed must be regarded as radiologically expended, i.e., additional exposures at operational levels will probably be followed later by appreciable damage to health.

COMMENT

7. These rules are based on the need for preserving operational efficiency of a limited number of persons.

8. They are very high levels at best and those so exposed undergo serious risk of becoming late war casualties from various causes.

9. Evacuees and other large groups should not be allowed deliberately to accept such high exposure levels. For such groups, 25 r during the emergency period should probably be the upward limit for planning and operations.

10. Any decision as to fitness of personnel for further duty can be made only by the professional health advisor to whom doubtful cases will be referred.

APPENDIX 5 to
ANNEX E to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

MANAGEMENT OF VEHICLES CONTAMINATED BY RADIOACTIVE FALLOUT

OBJECT

1. The object of this Appendix is to provide guidance on the protective measures desirable when using vehicles in contaminated areas and to indicate the standards of radiation safety for personnel in vehicles.

APPLICABILITY

2. This directive may be considered as interim. While it is based on data obtained from experience with low yield weapons, it is believed that the principles will hold also for larger yield weapons. The guidance herein is intended for what is expected to be normal conditions; common sense, good judgment and advice from Health and Monitoring Services should be used in all abnormal or doubtful situations.

GENERAL

3. Vehicles can become radioactive by:-

   a, Neutron-induced radioactivity in metallic parts:

   b. Direct contamination by the descending fallout cloud:

   c. Traversing fallout-contaminated areas.

4. Neutron-induced radioactivity - Heavy armoured vehicles may survive blast and heat damage while still within range of the promptly-emitted neutrons from weapons in the KT range. This is of military interest only - in Civil Defence, where MT weapons are expected, any vehicles within range of the prompt neutron-radiation most probably will be destroyed by blast and heat.

5. Direct contamination by the descending fallout cloud: Evacuation convoys are most likely to be caught by the fallout. To avoid tracking of fallout-material into clean reception areas, vehicles so contaminated should be cleaned at the perimeter of reception areas by methods described below. Their occupants will probably need personal decontamination.

6. Traversing fallout areas: Vehicles that have been driven through W zones will not need cleansing urgently; when circumstances permit, they should be surveyed and decontaminated if necessary.

FACTORS GOVERNING INTENSITY AND CONTAMINATION

7. The physical nature of the vehicle fabrics. Canvas collects and retains dust, including radioactive dust. Open vehicles are prone to more wide-spread and more intense contamination than are closed vehicles. Sedan-type automobiles can be kept partially dust-free inside by closing windows and air-conditioning systems.

8. Presence of grease and oil on free surfaces. Mechanical parts free of surface grease and oil collect less fallout-dust than greasy or oily parts.

9. Dust and mud conditions. Mud, rain, dust and damaged surface-paint tend to hold fallout to the vehicle. Dry fallout on smooth undamaged painted and metallic surfaces (e.g. on engine-hoods of passenger-cars) does not tend to cling: fast driving or a fresh wind blows most of it away.

10. Road surfaces. Vehicles traversing paved roads through fallout areas will pick up relatively little contamination. Those passing over muddy roads will collect more, wherever the mud splashes (cf. 9 above). Vehicles driven over dusty contaminated roads will collect fallout material along with other dust.

11. Ventilating Systems. When in use, the ordinary heating and air conditioning systems of passenger-cars will allow some dust to reach the interior.

12. Apertures in floors, etc. Dust will reach vehicle interiors through such apertures.

13. (In both cases, 11 and 12 above, radioactive contamination mixed with ordinary dust can contaminate vehicle-interiors).

14. Tracking-in by driver and passengers. In closed vehicles particularly, this factor will probably be more important than the others in contaminating of interiors.

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15. Shielding. The shielding value of nearly all passenger and commercial vehicles against the penetrating gamma rays from the fallout is, for practical purposes, nil. Calculations of gamma exposure-rate and integrated whole-body exposure, stay-times and the gamma hazard generally, will be made as if drivers and passengers were on foot.

STANDARDS OF RADIATION-SAFETY FOR DRIVERS AND PASSENGERS IN VEHICLES CONTAMINATED BY FALLOUT

16. A vehicle will be deemed fit for use during the emergency period if the gamma-intensity at the position normally filled by the abdomens of driver and passenger (including casualties on stretchers in ambulance vehicles) is 1 r/hr or less, with doors closed.

17. The following provisions must also be applied to the above standard:

a. The whole-body exposure must not exceed the permitted daily, weekly or six-weeks' exposure set out in the rules and standards for maintaining operational efficiency in the face of radiation exposure, and

b. as much dust as feasible has been removed from seats, floors, interior walls, steering wheel and manually operated driving controls, and

c. the driver must wear cap, coveralls, scarf and particularly gloves to protect him against the beta hazard, and

d. a clean pad about as thick as a double-folded blanket must lie between driver and the horizontal surface and both vertical surfaces of the seat, to protect his back, buttocks, and calves from the beta hazard, and

e. the time of occupancy of seats of the vehicle in any one period is not longer than a normal tour of duty in the working day.

18. It should be noted that:

a. at early times after detonation the limiting standard of 1 r/hr is very roughly similar to the standard for the W zone. In the interests of practicability, this intensity can be accepted for the emergency period.

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b. A relaxation of the W Zone standard for drivers makes necessary careful control of individual exposures and individual dosimeters should be provided for this purpose.

CONTROL OF CONTAMINATION

19. Before deliberate entry to a contaminated area, the driver of a vehicle should cover floors, seats and (in ambulance vehicles) stretchers with discardable coverings, to facilitate decontamination. After the tour, these coverings will be removed and disposed of safely before monitoring of the vehicle.

20. When feasible, before entry, surplus grease and oil on engine and other working parts should be removed by steam-cleaning.

21. Before deliberate traverse of a heavily contaminated area, windows, heating and ventilating systems should be closed; they may be re-opened for comfort's sake once the W Zone is reached.

22. In contaminated areas particularly, muddy and dusty roads must be avoided as far as possible.

23. On arriving at destination, the driver should remove seat and floor covering; (see para. 19) and monitors should survey the interior positions of interest (cf.16 above); if the gamma intensity at these positions does NOT exceed 1 r/hr, no decontamination will be needed for the emergency period.

24. If the intensity exceeds 1 r/hr, then, after removing seat and floor covers, the following sequence of operations should be carried out:

a. Hose down vehicle exterior and re-survey. If intensity still exceeds 1 r/hr, then,

b. Dust out or vacuum-clean interior thoroughly, particularly crannies, truck and upholstery. If intensity remains above the set level, then:

c. Hose off under-surfaces. If still unsuccessful, then:

d. Steam-clean oily and greasy parts and all exterior surfaces, remove upholstery and canvas covering (if vehicle is so fitted). If intensity still remains above the set level, then:

e. Consult Monitoring Services and Health Services with a view to parking the vehicle to allow radioactive decay to reduce the hazard; or (in grave need) to limiting more strictly its periods of use.

25. The following points should be noted in connection with the above:

a. Application of detergent will increase the cleansing action of ordinary hosing:

b. All persons engaged in cleansing vehicles should use personal protective and cleansing methods as advised by Health Services.

c. Simple arrangements for conducting wash-water into seepage pits (improvised if necessary) are required to avoid spreading contamination.

d. All discarded seats, upholstery, covers, etc., must be disposed of in an orderly way as directed by Health Services.

e. Parking facilities must be arranged, under advice of Health and Monitoring Services for vehicles that resist decontaminations. Periodic re-survey of these vehicles must be made to avoid unnecessary impounding.

MECHANICAL BREAKDOWNS IN X, Y AND Z ZONES

26. Minor mechanical adjustments and tire changing. Passengers will remain in the vehicles. Drivers will not touch external surfaces with ungloved hands, will not kneel or lie down any more than necessary: if kneeling and lying cannot be avoided, drivers must dust off clothing as well as possible before re-entering their vehicles and pay special attention to cleaning the interior positions on completion of the run.

27. Major (time-consuming) repairs. Passengers will be transferred to another vehicle and the disabled vehicle will be towed out.

VEHICLE REPAIRS

28. Vehicles needing major repairs will be surveyed by Monitoring Services before anything is undertaken. Health Services' advice will be required in most cases. Washing-down and steam-cleaning of greasy and oily parts

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will be among the active procedures taken to reduce the radiation hazard to mechanics. If these fail to meet the requirements of Health Services, parking under strict safety-control is necessary, to permit decay to safe levels.

29. Any vehicle parts that cannot be rendered safe by these methods must be disposed of under Health Services' advice.

30. Mechanics working on vehicles that have been contaminated will wear clothing as set out for drivers of engineer-equipment (see below); should be kept under close observation for over-exposure and will be decontaminated carefully. The hands and any other parts of the mechanic's skin which could or do become greasy, will require special care.

31. All abrasions of the skin should be covered by Scotch tape before work is begun, if Health Services agree.

FIREFIGHTING AND RESCUE VEHICLES

32. The same safety-precautions apply as stated for passenger vehicles. This type of vehicle, because it is more open, is more likely to become contaminated by direct fallout, road-dust and splash.

33. The crews of such vehicles, therefore, should take precautions as follows:

a. Wear complete firefighting and rescue dress which will provide protection against the beta hazard. The former is easily cleansed by hosing:

b. Despite a. crews should avoid indiscriminate and unnecessary contact with contaminated ground and objects; in contaminated areas, ladders, boxes, tools, hose, etc., should be handled only by persons wearing waterproof or other heavy gloves:

c. Individual radiation exposure must be controlled by dosimeter instruments.

d. Those engaged in wet decontamination of firefighting and rescue vehicles should wear, where available, waterproof operational dress:

e. Care must be exercised by rescue personnel to ensure that all loose contamination on crates and equipment has been reduced to a safe level before re-loading, that is, to the level accepted for the vehicle itself (para. 16, above).

f. Whenever the situation permits, the vehicles must be monitored and decontaminated to acceptable levels (see para 16 above). Under most circumstances, hosing-down with water under pressure should be satisfactory and will at least greatly improve the situation.

g. After each tour of duty, firefighting personnel should be hosed down while still wearing full equipment before standard personal decontamination is conducted.

ENGINEERING (EARTH-MOVING) VEHICLES

34. These vehicles, which tend to accumulate dust, are hazardous to the driver because of such accumulation and because they raise dust in their environments.

35. To shorten the period of occupancy, these vehicles should be left at the site of operations, when not in use, and the driver should be driven in and out in another vehicle, when work is being done in any but a W Zone.

36. When possible, these pieces of equipment must be hosed down thoroughly at regular intervals. A routine 4-hour interval is recommended; water under high pressure is preferred.

37. The seat must be covered and the covering safely disposed of at the end of each operation (see 19 and 23 above). Any type of covering is useful, e.g., thin board, plastic, packing paper, though an impervious material is preferred.

Note. WXYZ ZONES - Used as a method of control by Civil Defence for operations in a contaminated area. WXY or Z zones each represent a different degree of fallout hazard and, therefore, different degrees of population control:

a. The W Zone. That area of operations lying outside the fallout hazard. An area in which unrestricted activity of the population may be permitted with safety.

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b. The X Zone. An area in which the population may be released to unrestricted activity after a period of up to 48 hours in refuge. Radiation intensity will not be as high as that in the Y or Z zones.

c. The Y Zone. An area between the X and Z zones which will be subjected to a lesser degree of radiation than the Z zone. After a period of up to 48 hours controlled movement outside the fallout shelters may be permitted. This will continue until radiation intensity has dropped to safe limits.

d. The Z Zone. The Z zone will be an area (other than a "hot spot") subjected to very high radiation intensities. Even after a period of 48 hours, radiation will still be so great that people remaining in fallout shelters will be in danger from a prolonged exposure to excessive radiation. A decision to evacuate people from fallout shelters in the Z zone to the W zone, to prevent sickness and death, may result.

APPENDIX 6 to
ANNEX E to
Alberta Survival Plan
Volume Two
Dated: February 1961

PROTECTION BY CLOTHING AGAINST RADIO-ACTIVE FALLOUT

OBJECT

1. The object of this Appendix is to provide guidance on the most suitable forms of clothing for wear in contaminated areas.

APPLICABILITY

2. The recommendations contained herein are based on the latest scientific data available. It is pointed out that such data are derived mainly from experimental and low yield weapon tests, although it is believed that the recommendations will be valid for large yield weapon fallout.

GENERAL

3. Clothing offers virtually no protection against gamma radiation. Therefore skin injury resulting from exposure to fallout beta radiation will be of greatest concern. The potential skin injury can be reduced or eliminated by the use of proper clothing and method of dress.

CLOTHING PROTECTION

4. Some fabric textures allow easy removal of radioactive dust while others tend to hold it. Closely-woven gabardine and cotton, for example, are preferable to materials of coarse weave (tweeds, burlap, canvas) for this reason. The heavier the clothing and the greater the number of layers, the greater is the protective or shielding value against beta. Persons who must work in fallout areas should wear undergarments and protective overgarments. Waterproof overgarments of any kind are an advantage; the working-clothes of firefighters are a good example. Wools and cottons in general are preferred to plastic fabrics because of their superior heat-resistant properties.

5. Clothing ordinarily worn by females does not give adequate protection against the fallout hazard. Females who are likely to have duties to perform in fallout areas must don male attire; the same is desirable

for female evacuees since they may be caught in descending fallout or may have to traverse a fallout field. The commonly worn plastic overshoes and slacks are useful protection if heavier items are not readily available.

6. Special care must be taken to protect the tender skins of infants and young children. Envelopment of the body (except the nose and mouth) in sheets or blankets is useful.

PROTECTIVE CLOTHING FOR WORK IN AREAS CONTAMINATED BY FALLOUT

7. The following is a general guide to the selection of protective clothing:

- a. Boots: Footwear should be heavy. A gum-rubber ankle or high boot is preferred; second choice is a leather ankle boot:
- b. Coverall: This should be provided, in the form of a mechanic's or military-type coverall. The trouser-cuff is worn outside the boot-top and bound firmly to prevent dust getting inside. Arm-cuffs must be bound for the same reason:
- c. Gloves: Heavy cotton work-type gloves should be worn:
- d. Scarf: An improvised, discardable scarf should be worn around the neck and under the coverall collar to prevent dust getting inside the coverall in this area:
- e. Head-cover: An improvised cloth head-cover should be worn under the hat to protect the scalp against contamination:
- f. Face-cover: A large handkerchief should be worn over nose and face in dusty operations.

8. It is not believed that much danger exists from inhalation of radioactive materials under early fallout conditions. Nevertheless, breathing is more comfortable if dust is excluded from the nose and throat and a rather remote inhalation hazard is further reduced by this simple means.

APPENDIX 7 to
ANNEX E to
Alberta Survival Plan
Volume Two
Dated: February 1961

DEFINITION OF AREAS OF SERIOUS FALLOUT

INTRODUCTION

1. Under the Civil Defence Order (PC 1959-656), the Department of National Defence was given, amongst others, the responsibility for "controlling, directing and carrying out re-entry into areas damaged by a nuclear explosion or contaminated by serious radioactive fallout ....."

DEFINITION OF "SERIOUS FALLOUT"

2. It has been agreed by the Interdepartmental Radiological Defence Working Group that an area of serious fallout would be tentatively defined as that area (when known) where unprotected persons will receive a seven-day dose of 750 roentgens or more. Assuming that all persons in their homes and places of work would have a protection factor of 5, an outside dose of 750 r would be reduced to 150 r, which would be sufficient to produce acute effects of radiation sickness within a seven-day period.

NOTES OF EXPLANATION (By Alberta EMO)

Note 1. On the basis of the above definition and assuming a 5 megaton weapon, the area of "serious fallout" would roughly coincide with "Zone Z" of the fallout pattern. Zone Z is indicated as an area of about one thousand square miles, measuring approximately one hundred miles down wind and ten miles across. Complete remedial evacuation of Zone Z would have to be carried out, as soon as possible after 48 hours.

Note 2. A cumulative dose of 750 r in seven days might be received, outside of shelter, at the outer fringes of Zone Z, with much higher contamination towards the centre of this Zone.

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Note 3. The following table has been prepared, to indicate the radiation levels which might be expected at the outer fringes of Zone Z, at various times after the detonation of a 5 megaton weapon.

Time	Dose Rate (In the open)	Cumulative Dose (Unprotected)	Cumulative Dose under Refuge (Protection Factor of 5)
H + 7 hours	25 r/hr	400 r	80 r
H + 48 hours	2½ r/hr	600 r	130 r
H + 7 days	½ r/hr	750 r	150 r (acute effects)

APPENDIX 8 to
ANNEX E to
Alberta Survival Plan
Volume Two
Dated: February 1961

FALLOUT ZONES AND POPULATION CONTROL

GENERAL

1. For purposes of control in a fallout area, the contaminated area will be divided into four zones of radiation intensity, designated as W, X, Y and Z. Each zone represents a different degree of fallout hazard and, consequently, a different degree of population control.

CONTROL ZONES

2. Zone W.

a. Definition. Zone W covers the fringe of the fallout area, with an intensity of .1 r/hr on the inner boundary (towards Zone X), decreasing to no significant hazard on the outer boundary, at 48 hours after a nuclear explosion. (H+ 48).

b. Controls. The population will have to remain in fallout shelter for the first 48 hours. After that, unrestricted activity will be permitted, as the zone would cease to exist for public control purposes.

c. Marking of Boundary. The outer boundary of Zone W will be sign posted and the public within warned.

3. Zone X.

a. Definition. Zone X covers the area inward from Zone W(.1 r/hr) to the outer boundary of Zone Y where the intensity at H + 48 hrs reads 1 r/hr. This zone will be lightly contaminated and may extend 600 miles down wind and 70 miles across, for a 5 MT weapon. Some time after the detonation the intensity will reach up to 100 r/hr and fallout shelter is mandatory.

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b. Controls.

(1) The public in fallout shelter will accumulate 3 to 30 r in the first 48 hours. After this period, they should not spend more than 4 hours per day outdoors. Indoor occupations will return to normal, but rest periods should be spent in fallout shelter. After the first week, the zone will return to normal, except that outdoors activities should be limited to 8 hours per day for the next 3 months.

(2) The public may leave the zone, but will be advised against it, due to exposure while travelling, the over-crowding of the fringe areas and the unlikelihood of finding suitable fallout shelter against a possible new attack.

c. Marking of Boundaries. Boundaries of Zone X will be marked using information supplied by the Nuclear Detonation and Fallout Reporting System (NDFRS).

4. Zone Y.

a. Definition. Zone Y covers the area inward from Zone X (1 r/hr) to the boundary of Zone Z where the intensity at H + 48 hrs reads 2.5 r/hr. Zone Y will have received heavier contamination than Zone X and could extend for 300 miles by 25 miles, for a 5 MT weapon. During the first 48 hours the dose rate in the open may have reached 250 r/hr and fallout shelter is mandatory. Even in fallout shelter, a cumulative dose of 30 r to 70 r may be received within the first 48 hours.

b. Controls.

(1) Stringent precautions must be taken during the succeeding few weeks to avoid radiation sickness. After the first 48 hrs, and continuing for the next 12 days, the time spent out of fallout shelter must be restricted to not more than 2 hours

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per day in the open, together with 8 hours under some cover, (e.g., in a building). After H + 14 days, the time spent in the open may be increased to 4 hours per day for the following three weeks, and then 8 hours per day for the remainder of the first year.

(2) Leaving the zone will be discouraged.

c. Marking of Boundaries. The signing of the zone will take place as soon as possible after H + 48 hours.

5. Zone Z.

a. Definition. Zone Z covers the inner core of the fallout pattern, from the inner boundary of Zone Y (2.5 r/hr) to ground zero (i.e., point of detonation) where the radiation intensity is fatal.

b. Controls.

(1) At one hour after the nuclear detonation, the dose rate on the outer fringes of Zone Z would be at least 250 r/hr. If the population in this zone have the benefit of a protection factor of 10 in their fallout shelter, their minimum cumulative dose will be about 85 r after 48 hours, and much higher cumulative doses will be received in parts of the zone.

(2) Zone Z might cover an area of over 1,000 square miles (approx. 100 miles down wind and 10 miles wide), from which complete evacuation will have to be carried out, as soon as possible after 48 hours. Evacuation before this time would probably increase the cumulative dose received by the evacuees, due to the high intensity to which they would be exposed during evacuation.

(3) The clearance of Zone Z will be carried out under the direction of the Army, in close co-operation with provincial and municipal authorities.

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Plan

(4) The public will be kept informed of the remedial
plan and be given instructions by emergency radio bro

REFERENCES:

a. Canadian Army Manual of Training
CAMT 2-91 "Survival Operations (1961)"

b. Canadian Civil Defence College
Training Precis NSOR 23 (November 1961)
"Concept of Operation in a Fallout Area"

ANNEX F to
Alberta Survival Plan
Volume Two
General Information
Dated: February 1961

NATIONAL SURVIVAL ATTACK WARNING SYSTEM

INFORMATION

1. The Civil Defence Order, 1959 (See Volume One, Planning Instructions, Annex C) designated the Minister of National Defence as the responsible Minister for certain specific civil defence responsibilities including:

   a. Provision of technical facilities and operation of a system to give warning to the public of the likelihood and imminence of an attack;

   b. Determining the location of nuclear explosions and the patterns of fallout, and giving the necessary warning of fallout to the public.

2. The Canadian Army was designated by the Minister of National Defence as the Service responsible for the assessment of enemy activity which might lead to the necessity for warning the public, and for the provision of such additional information as might be necessary to minimize casualties caused by radioactive fallout.

3. A National Survival Attack Warning System (NSAWS) was established by the Canadian Army on a full-time basis, to pass on warnings to Provincial Warning Centres in the event of an attack, and to give radioactive fallout information when necessary. The present system consists of a line network connecting the primary source of attack information with the Federal Warning Centre and Provincial Warning Centres. The system will be supported by a military radio network.

PUBLIC WARNING STATES AND PUBLIC ACTION SIGNALS

4. Attached hereto as Appendix 1 is a chart showing the types of

warning to be expected and the action to be taken. A paper explaining the Public Warning States and Public Action Signals was distributed on a wide basis by Alberta Emergency Measures Organization Headquarters on 10 June 1960; (file numbers W-1-2 and W-1-5). This paper set out in detail the procedure for receiving and verifying emergency calls, and will be incorporated in the Alberta EMO Communications Operational Plan.

DEVELOPMENT OF THE NSAWS

5. The Warning System and the Nuclear Detonation and Fallout Reporting System when completely established will include:

a. Warning Centre at NORAD HQ;

b. Regional Warning Information Centres established at selected subordinate NORAD installations concerned with the tactical air defence battle over and adjacent to Canadian territory;

c. A Federal Warning Centre at the location of the Federal Government, designed to function as the system control element at the Federal Government level;

d. Provincial Warning Centres in each Province designed to provide a joint Army/Provincial Government Operations Centre with a continuing display of the tactical air battle, nuclear detonation and fallout status, and also to serve as the primary element of a Provincial Warning Network System;

e. Nuclear Detonation Reporting Posts situated adjacent to the probable target areas;

f. Radiation Intensity Reporting Posts located on a 45-mile by 15-mile grid throughout the populated area of Canada;

g. Filter Centres located at selected points where

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radiation intensity reports will be calculated and passed to Provincial Warning Centres.

EXERCISES

6. Exercises of various types to test the system will be carried out from time to time. These exercises will involve all communication facilities, Military Forces, Police Forces and Civil Defence Forces necessary to ensure the complete and efficient functioning of the system.

APPENDICES

Appendix 1 - Public Warning States and Public Action Signals.

APPENDIX 1 to
ANNEX "F" to
Alberta Survival
Plan, Vol. Two

PUBLIC WARNING STATES AND PUBLIC ACTION SIGNALS

PUBLIC WARNING STATES	MEANING	BY WHOM ISSUED	HOW ISSUED	PUBLIC ACTION SIGNAL	ACTION TO BE TAKEN
1. "ALERT" Warning	Attack likely. (Up to three hrs. warning.)	Canadian Army, on initial authority of Prime Minister of Canada or his personal delegate.	a. By NSAWS, to Province. b. By AGT fan-out etc. in Province	For at least three minutes: a. Sirens, horns and whistles -- steady blast. b. Bells -- continuous ringing.	a. Tune to designated emergency radio broadcast station for further instructions. b. All CD headquarters to be manned. c. All CD communications to be activated. d. CD Authorities prepare to implement Survival Plans. e. Instructions to actually implement Survival Plans are issued by Alberta Provincial Authorities over Emergenc Broadcast Network; supplemented by special instructions by telephone and communications network as necessary.
2. "TAKE COVER" Warning	A Canadian area subject to imminent attack. (Approx. 20 min. warning.)	Federal or Provincial Army Commander	a. By NSAWS to Provincial Authorities. b. Then by fan-out or emergency broadcast network and all available means.	For at least three minutes: a. Sirens -- undulating or warbling signal. b. Horns and whistles -- series of short blasts. c. Bells -- irregular ringing.	Take best available shelter from attack immediately. (Given 15 to 20 minutes befor attack if possible.)

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PUBLIC WARNING STATES	MEANING	BY WHOM ISSUED	HOW ISSUED	PUBLIC ACTION SIGNAL	ACTION TO BE TAKEN
3. "RADIATION FALLOUT" Warning	A municipality is in danger from radioactive fallout.	Federal, Provincial or Municipal authority, when any municipality in danger from radioactive fallout.	a. By NSAWS to Province. b. By fan-out and radio broadcast in Province.	As for "ALERT" Warning, plus detailed Emergency Broadcast Network instructions.	Await instructions from Provincial or local authorities, to follow immediately.
4. "ALL CLEAR"	Area concerned is considered free of attack threat for an hour or more. (Cancels "TAKE COVER", but not "ALERT" in area concerned)	Local Army Authorities, after consultation with Provincial Authorities.	Emergency Broadcast Network.	Emergency Broadcast Network.	Await further instructions. (An "ALL CLEAR" does not indicate that the area is free from fallout danger.)

DATE DUE

JUL 17 1997